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Effectiveness In Grey Room Operation

Can it be improved today?

By MYRON W. ALLING

THE business of bleaching is one of the most important processes in a textile bleaching, dyeing and printing plant.

The present business era is one of competition, of profits through effectiveness of operation rather than through chemical and physical control of supplies. This control as it relates to bleaching is quite well standardized. This does not mean that perfection has been reached; to the contrary, the chemical research workers assure us of entirely new developments which will provide a clearer understanding and a better control of the technique of bleaching reactions. Unquestionably the chief thing to aim for at the present time is effectiveness of operation.

The average person thinks of bleaching as making something white or whiter. The superintendent of a bleachery thinks of bleaching in terms of whether or not his bleacher will make a successful job of bleaching not alone in making the goods whiter, but whether or not the goods will be free from frays, tears, holes, stains, spots, and repellant deposits, whether or not they will be strong, whether or not they will show yardage gains over the grey yards, and whether or not these cloths will be bleached in time to carry out their routing schedules.

The manager looks to his superintendent to fulfill these things as a whole, but he is equally interested in the cost of carrying on the production because, after all, the figure that represents the difference between the cost of production and the price which he receives for doing the work is the profit left over.

For these reasons the natural development for the actual layout of a department for bleaching has been along the lines of well-balanced production centers, direct line layouts, short moves, and adequate room for internal transportation and storage. They include the workmen, the machines, the apparatus, and the necessary space to carry on the work without crowding the operatives.

Bleach House Production Centers and Chart

There are nineteen production centers in the bleach house. By referring to the chart one can readily note their positions and also the progress of the cloth through them by following the direction of the heavy solid line. I will enumerate them as follows:

A. Grey goods bale storage room.
B. Space for opening up, laying out and stamping identification numbers on the pieces from the bales.
C. Spaces for sewing the ends of the pieces together.
D. and E. Sanding and singeing room for cleaning the surface of the cloth.
F. Series of bins in which to steep the singed cloth.
G. Washer in which to wash the singed cloth.
H. Battery of kiers where the goods are boiled, G. washer, as mentioned above in item number seven, to wash the boiled goods through.
I. Saturating box and mangle to impregnate the cloth with the chlorine bleaching solution, S. series of J-shapen Gantt pilers to receive the chlorine impregnated cloth, G. washer to wash the chlorine out of the goods.
J. Antichlor (SO_2) saturating box.
K. Series of storage bins for the fully bleached cloth.
L. Central electrical control board to stop and start any one of the four washers in case an entanglement or a breakdown should occur in any of the strands or ropes of cloth.
M. and N. Tank car and gas-supply room for supplying gas to the singer.
P. Several mixing and storage tanks where the kier-boiling solutions are made up.
Q. Chlorine mixing unit for making the bleaching solution.
R. Winder for winding such goods as do not require any treatment in the bleaching department except laying out, numbering, sewing the ends together, and winding.

A Substitute for Rule of Thumb Methods

The usual bleach house foreman, as far as the personnel under him is concerned, has a one-man control, and his primary duty is leadership. This leadership along with directing the actual operations of bleaching tends to make of his productive efforts one of rule-of-thumb methods, and, in most cases, the actual outlay of cash for labor and production is more than it should be.

The modern bleachery in which the organization has been consciously and intelligently developed is usually found with a plan of organization that has been molded to assist a foreman to make a substitution of science for rule-of-thumb methods.

This science as applied to bleaching is not complicated. It only involves a man who can devote his whole time to the study of the work that is performed by each man in the department and can check the speed and mechanical condition of the various machines in use.

If he finds that the work can be performed by moving the men—as in checkers—to a more advantageous position in order to win the game, he points out to the foreman, through the manager, the method of working the men from these new positions so that he will understand the advantages of the better scheme for directing them.

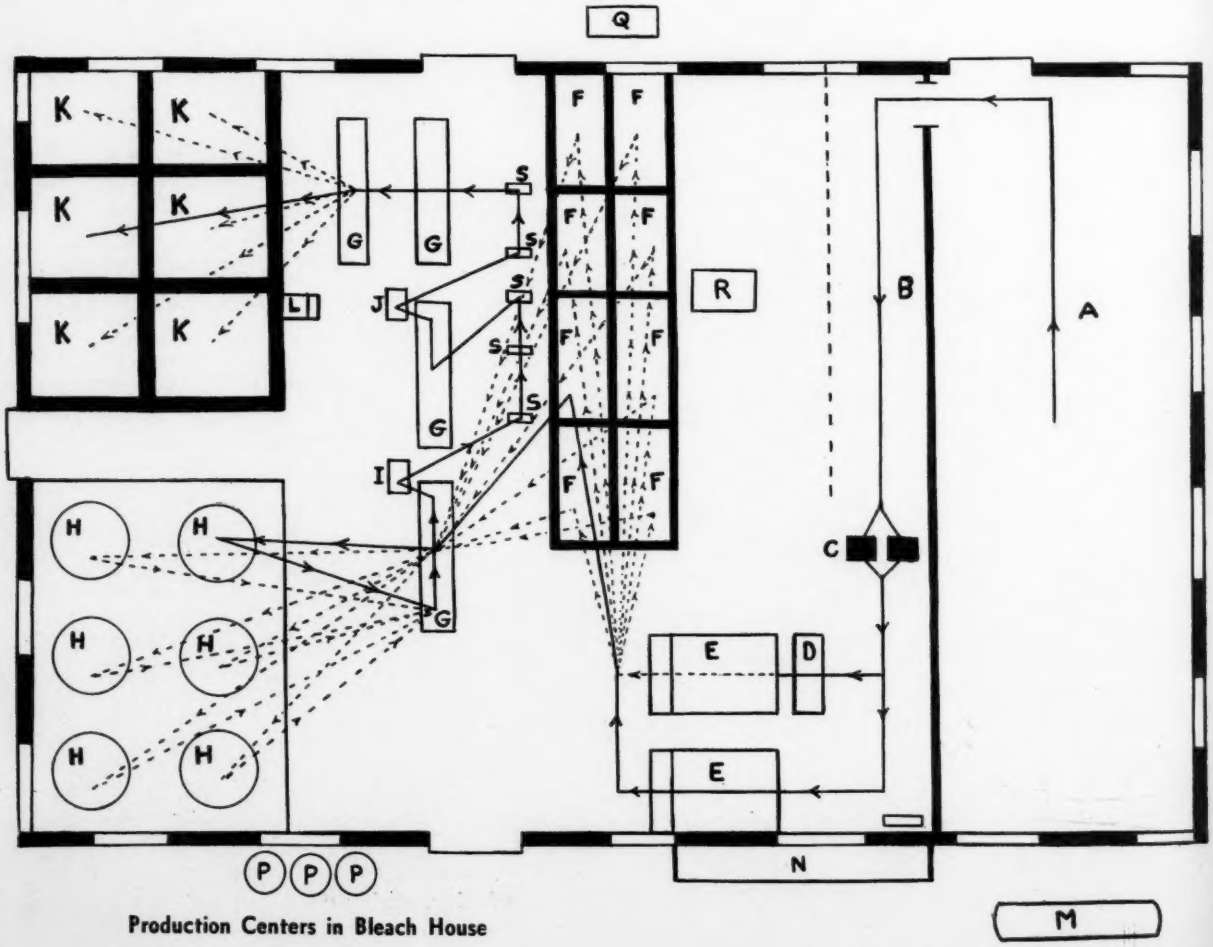
If he finds a machine that can be speeded up by making a minor change or repair in its construction, he advises the foreman of the necessary changes and makes him see that the result of his directing will automatically become more efficient by having the corrections made.

If his observations tell him that certain operations can be better correlated, speeded up, made easier, etc., by the installation of one or more of the most up-to-date aids to lowering the cost of production, he will recommend that, if it relates to labor, the personnel of the department be put on a system of Task and Bonus or if it relates to machinery, he will recommend the installation of suitable apparatus. If it happens that he has been schooled in bleaching, he may go so far as to recommend changes in formulas that will result in savings of cost in chemicals and other materials.

The Work of Consultants in Management

It has been my privilege in one plant to see the old order of things give way to the results obtained by the substitution of the newer scientific methods of studying the requirements of labor and machinery.

Everyone must realize that this cannot be done by anyone who is smothered with all of the problems of production. It has to be placed in the hands of someone



Production Centers in Bleach House

with experience who can give the matter his entire attention over a period of time sufficiently long to exhaust the ingenuity and experience of the man.

It is just as difficult for a foreman who has devoted his thoughts almost exclusively to leadership and directing the chemical and physical aspects of bleaching to reach the apexes of the refinements of cost control as it is for the specialist in those things to work them out.

It calls for a modification of thinking and an adaptability comparable to the modification which an animal or plant undergoes for existence under the conditions of changed environment.

In order to acquaint my readers with the application of Task and Bonus to the laying out, sewing, and singeing of cotton piece goods, as well as the phraseology and clarity of thought used by consultants in management, I shall describe each one from the point of the preliminary study recommendation to the final adopted recommendation, and I will, in most cases, resort to the manner of expression in common use by consultants.

A scientific study of labor, machinery, and production in any department is based upon the powers of observation. A thorough check-up may take one day or it may take six months. It all depends upon the size and condition that the department is in.

After the preliminaries have been thoroughly gone over by the consultant, the results of the investigation are written up and submitted to the manager in the following form:

Recommendation No. 1—March 4, 1931

Grey Room

It is hereby recommended that the following changes be made in the layout and routine of the Grey Room:

1. That all the sewing be done by the two girls, whose machines will be placed convenient distances apart along the east side of the Grey Room in front of the singer. This relocating of the sewers will eliminate unnecessary trucking to the storehouse where heretofore one of the sewers has been located.

2. That all of the laying out be done by one man who, because of the present type of sewing machine used, it is believed can layout for both sewers, without causing either to wait for work.

3. That the trucking of bales from the storehouse to the Grey Room be hereafter assigned to a crew from the Yard Gang with their foreman in charge for it is believed that with an average daily delivery of 45 bales this work can be accomplished by two truckers and a supervisor in approximately one hour, and this time may be divided up into two or three periods per day as it is reasonably believed that the Grey Room foreman can so plan his work that he can call for only a portion of this work at a time (such as fifteen to twenty bales per delivery) which will enable him to keep sufficient work ahead of the layer-out without loss of production waiting for bales.

4. That the singer man's duties be extended to include the inspection and throwing up of ends of all trucks of grey goods sewed and the trucking of the same from the sewers, to a position in front of the singer or into one of the nearby bays to await singeing.

In order to allow more space in the Grey Room for the fair trial of the above-mentioned plan, it is further recommended:

1B. That all goods held for bale dyeing or jig dyeing be removed to a bay in the White Storage Room. It can be piled there in an orderly manner until such time as the dye house sends for it. This will give the Grey Room a much needed portion of the southern section for storage of goods waiting to be singed.

2B. That all goods held for the dye house and heretofore wound and stored in the Grey Room be hereafter wound in the Print Winding Department. It is estimated that there is a daily average of 15,000 yards of such work and it is fully believed that this can be handled more conveniently and to better advantage by the Print Winding because with two winders in the day and one at night and the department adjacent to the dye house, advantage of time and trucking will accrue in the form of direct labor.

It is believed that with a fair trial of this plan, one man can be saved in the Grey Room Department and a fundamental step made toward the installation of Task and Bonus.

Note:

Paragraph marked No. 1 refers to two sewing machines which were in two different rooms located at some distance from one another.

Paragraph marked No. 2 refers to work that had formerly been done by two or more of a group of several men.

Paragroph marked No. 3 refers to work that had formerly been done by the layer out with the help of the men mentioned in Paragraph marked No. 2.

Paragraph No. 1B refers to the storage of goods for bale dyeing and the winding and storage of goods for jig dyeing in the Grey Room.

Recommendations No. 2 and 2B (Five Days Later)—March 9, 1931

Grey Room

It is hereby recommended that the Three Needle Flat Singer Sewing Machine now located in the grey storehouse be fully overhauled, repaired and put into good running order.

The reasons for this recommendation are viz:

1—That this machine may act as a spare in case of a breakdown occurring to either the singer merrow or the two needle singer, both of which are now in constant use.

2—It is desired to use this machine regularly for a period in order to make the necessary studies prior to the installation of Task and Bonus in this department.

Recommendation 2B

Grey Room

It is hereby recommended that ten live flat trucks or skids be constructed by the Mechanical Department for

use in the Grey Room. They will be approximately the same size as the present dead skid now in use. It is further recommended that ten be constructed as a first trial lot.

The estimated cost per truck follows:

Labor (estimate)		$1.00
Material		
2 Swivel Casters	at 1.65	3.30
2 Non-Swivel Casters	at 1.00	2.00
Lumber (estimated)		1.80
Bolts		.35
		7.45
Overhead		
Estimated 40% of Labor and Material		3.38
Total Cost per Truck		11.83
Total Estimated Cost per ten Trucks		118.30

Savings

No detail saving is estimated, but it is confidently and reasonably believed that a saving in direct labor will be made with the use of the live skid as against the dead skid for the following reasons:—

(1) At the present time all dead skids have to be moved by means of an automatic lift truck. Much time is now lost because:

A—There is only one lift truck available.

B—It is frequently used to truck goods out of the department and therefore not always available.

C—It is rarely in the right place at the right time for use by the right person.

(2) It is reasonably believed that the truck loads of cloth can be more easily and expediently moved on live skids than on dead skids from Layerout to Sewer and from Sewer to Singer.

Note:

Recommendation marked No. 2 refers to a sewing machine that was in poor mechanical condition and its speed was below the speed of the same type of machine in another plant. It would only sew 240 inches per minute on account of the one-third horse power motor running hot at higher speeds and the failure of the knife to cut off the ends of the cloth properly. After correcting both of these faults, it ran up to the standard speed of 300 inches per minute without any further serious trouble.

Recommendation No. 3—April 20, 1931

(Six weeks and five days later than Recommendation No. 1)

It is hereby recommended that the Task and Bonus rate be applied to the Layout and Sew Operation.

Operation No. 10 Layout and Sew — Grey Room Department

I. *Task*

A .022 Hr. (1.32 minutes) per Three Needle Seam

B .0165 Hr. (.99 minute) Merrow Seam.

II. *Bonus*

(1) 60% of Time Saved plus 20% of Time Taken to Sewers.

(2) Layerout will receive the average of the Bonus Hours of the two Sewers providing both Sewers accomplish the Task.

If one of the Sewers fails to accomplish the Task, the Layerout will receive as a Bonus 75% of the Bonus Hours of the successful Sewer.

III. *Classification of Work*

This task covers all the grey goods to be opened and sewed in the Grey Room.

IV. *Conditions*

(1) Layerout will be provided with stand, stamp, numbers, stamp pad and knife for cutting cord and burlap.

(2) The Three Needle, Track Equipped, Upright Singer Sewing Machine has a speed of 3648 R.P.M., which gives it a feed of 300 inches per minute.

(3) The Merrow Sewing Machine has a speed of 3623 R.P.M., which gives it a feed of 276 inches per minute.

V. *Duties*

A—Layerout

(1) The Layerout will check all bale numbers before removing burlap and laying out pieces. With this duty all bales will be double checked for the Foreman of the Storage Crew also checks all bales delivered into the Grey Room, and personally supervises their transfer from Storage to Grey Room.

(2) The Layerout will take the pieces from the bales, stamp the Lot Number, with the tar mark not over six inches from the end, pile the pieces on a flat truck, throw the ends over the top when truck is full and push truck up to Sewer.

(3) When the Singer Operator is performing some necessary duty in connection with the Singer, the Layerout will pull the truckloads away from the Sewers wherever the truckloads have been sewed, otherwise the duties of withdrawing the sewed truckloads, and inspecting and throwing up of the ends will be accomplished by the Single Operator. The Layerout, however, will not inspect and throw up the ends.

B—*Sewers*

The Sewers will square all ends, and sew the seams straight, even, face to face, and avoid all puckering of cloth.

VI. *Detail of Operations and Synthesis*

A—SINGER THREE NEEDLE SEWER

Element	*Time Needed*	*% Occurrence*	*Time Allowed*
1. Place First End on Track and Square End	.15	100	.15 min.
2. Take Second End and Square	.10	100	.10 min.
3. Pin Second End on Track	.20	100	.20 min.
4 Pin First End	.15	100	.15 min.

(Continued on page 139)

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

FEBRUARY 13, 1933

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NORTH CAROLINA STATE COLLEGE STUDENT SECTION

THE Student Chapter of the American Association of Textile Chemists and Colorists had as their guest, Mr. A. W. Chase, Sales Engineer of the Foxboro Company, Foxboro. Mass.

Mr. Chase was making his first trip through the South and gave interesting and instructive talks to two of the classes of the North Carolina State College Textile School.

Mr. Chase used for his subject: "CONTROL." In these talks, he explained and demonstrated the use of various instruments used in controlling the temperature on machines of the textile industry.

The operation of these control instruments, which is somewhat difficult for the novice to understand, was explained and demonstrated in such simple terms that the students have a very good idea of how such instruments work and understand more clearly the purposes for which they should be used.

Mr. Chase stressed the fact that by CONTROL, it was possible to obtain UNIFORMITY.

Mr. Fred Sprock of the Geigy Company, Charlotte, N. C., was also a recent guest of the Student Chapter of the American Association of Textile Chemists and Colorists.

Mr. Sprock gave an interesting talk on the method of using ammonium sulfate with sulfur dyes. He also spent several hours in the dye laboratory of the school making practical demonstrations to bring out the points of his talk.

As there happens to be no literature on this subject, as applied to the modern method, the students were fortunate in having the method explained and demonstrated by such an experienced man.

The Student Chapter of North Carolina State College frequently has the privilege of listening to lectures given by men who are well informed in the latest methods of dyeing and finishing as applied in the mills.

DAVID B. HARDIN,
Secretary.

Proceedings of the American Association of Textile Chemists and Colorists

An Accelerated Aging Test for Waterproofed* Ducks and Similar Fabrics[1,†]

By WILLIAM C. SMITH[2]

The value of a waterproofed duck or similar fabric depends not only upon its waterproofness when new but upon its continued proofness during use. This paper describes a method for testing and rating the waterproofness of such cloth and an accelerated aging treatment designed to produce changes in the waterproofness of the cloth similar to what may occur when it is used. A comparison is given of the waterproofness of fifteen representative fabrics after the laboratory aging treatment and after exposure out of doors. The results indicate that the test will be useful for the evaluation of waterproofed ducks and similar fabrics.

I. Introduction

THE conferences which led to the adoption of Commercial Standard CS28-32 "Cotton Fabric Tents, Tarpaulins and Covers" (U. S. Department of Commerce) developed the need for tests for waterproofness of waterproofed ducks and similar fabrics. The Textile Section of the Bureau of Standards studied several methods of test and found one form of the hydrostatic pressure test to be suitable for such cloth (mimeographed report of October 6, 1930). The Canvas Waterproofers' Association, the National Tent and Awning Manufacturers Association and other groups interested in the commercial standard then desired a laboratory accelerated test which would stimulate the changes in the cloth likely to occur under the conditions of use. The assistance of the American Association of Textile Chemists and Colorists in the development of this test was then requested and the Association assigned the problem to the author. The purpose of this report is to describe the test and the experimental work done in its development.

Samples from a series of waterproofed ducks supplied by various manufacturers were tested for waterproofness. Some of these tested samples were exposed to the weather for natural aging while duplicates were treated in the laboratory in attempts to simulate the effects of natural aging. After weather exposures of various durations up to 7 months and after the laboratory treatments the samples were again tested for waterproofness and the results of natural aging and of laboratory accelerated aging were compared.

II. The Fabrics

The series of waterproofed ducks included several types of duck and various waterproofing treatments as may be seen from Table 1. The first column shows the constructions of the fabrics. The data in the second column (grey weight) were calculated from the information furnished by the manufacturers. The proofed weights were determined by weighing definite areas of the fabrics and making appropriate calculations. The per cent of proofing material was calculated by subtracting the grey weight from the proofed weight, dividing the result by the proofed weight and multiplying by 100. It therefore includes all material added in the waterproofing treatments. Probably the values for per cent of proofing material, while only approximate, are satisfactory for the present purposes. These values together with the per cent of ash give indications of the nature of the proofing material.

Fabric number 33 is the grey fabric from which proofed fabric number 34 was made. Fabrics numbers 38 and 39 were proofed in a laboratory. All others are commercial waterproofed fabrics. Fabrics 28 through 32 were all waterproofed with the same kind of material; likewise, fabrics 36 and 37 were both waterproofed with the same kind of material.

It is seen from Table 1 that the proofed weights of the fabrics varied from 10 to 39 ounces per square yard. The per cent of proofing material (based on proofed weight) varied from some very small amount for fabric 27 to 8 per cent for fabric 25 and from 17 per cent to 32 per cent for the other fabrics.

III. Method of Test for Waterproofness

The waterproofness test used in this work was the "modified box test" described in a mimeographed report from the Textile Section of the Bureau of Standards dated October 6, 1930. As stated in that report, "it is believed that the 'modified box test' gives more information about the characteristics of a proofed duck than the various funnel tests, bag tests and hydrostatic pressure tests described in the literature."

*Waterproofness is used in this paper to mean the ability of a material to resist permeation by liquid water.

†Paper presented at Annual Meeting, December 3, 1932.

TABLE 1.

The Fabrics

Serial Number	Construction†	Weight in Ounces Per Sq. Yd. Grey	Weight in Ounces Per Sq. Yd. Proofed	Amount of Proofing Material (% of Proofed Weight)	Ash %	Air Permeability*
25	2-ply warp. ..... 2-ply filling.	10.1	11.0	8.2	1.05	2.63
26	" "	13.0	15.7	17.2	1.02	1.16
27	" "	10.1	10.1	?	1.11	6.68
28	Singles warp, 2 yarns woven as one. Singles filling.	14.9	19.3	22.8	9.7	1.31
29	" "	12.0	17.3	30.6	12.5	0.98
30	" "	10.0	14.3	30.0	11.5	1.10
31	3-ply warp. ..... 3-ply filling.	14.7	19.8	25.8	9.9	0.95
32	3-ply warp. ..... 2-ply filling.	11.5	17.0	32.4	14.3	1.23
33	4-ply warp. ..... 6-ply filling.	27.7	..	0.0	1.02	1.72
34	" "	27.7	39.1	29.2	6.7	0.35
35	Singles warp, 2 yarns woven as one. 3-ply filling.	12.0	16.6	27.7	15.2	nil
36	3-ply warp. ..... 3-ply filling.	14.7	18.7	21.4	3.78	nil
37	3-ply warp. ..... 3-ply filling.	18.0	21.9	17.8	3.67	nil
38	3-ply warp. ..... 3-ply filling.	14.9	18.0	17.2	1.02	1.04
39	" "	14.9	21.0	29.0	1.16	0.35

* Cubic feet per minute per square foot of fabric at pressure drop across fabric of 0.5 inch of water.

† All the fabrics are ducks, that is, closely woven, firm, heavy, plain-weave fabrics.

The apparatus for the waterproofness test makes it possible to expose a strip of cloth 4¼ inches wide to a constant hydrostatic pressure range of from 0 to 20½ inches, and to measure the amount and rate of leakage through the sample and the hydrostatic pressure at which leakage occurs and the variations in their values with time.

Figure 1 is a diagram giving essential dimensions of the apparatus and Figure 2 is a photograph of it. It is a cast iron box one side of which is to be closed by the sample under test. The sample is held in place by a heavy cast aluminum frame secured by wing nuts. The bottom of the clamping frame is provided with a trough for delivering the water which passes through the sample to a vessel where it is measured. If the sample leaks very badly the auxiliary plate, shown at the left in the photograph, is used. A linear scale is marked on the clamping frame so that the points at which leakage occurs can be observed in terms of hydrostatic pressure.

The procedure for a test was as follows:

A sample 26 x 6½ inches in size was cut from the cloth to be tested, the longer dimension being in the filling direction. The sample was clamped in position and a graduated cylinder was placed below the drain tube of the box to receive water passing through the sample. Using tap water at room temperature the box was filled to the overflow within one minute. When the water reached that level a stop watch was started. The

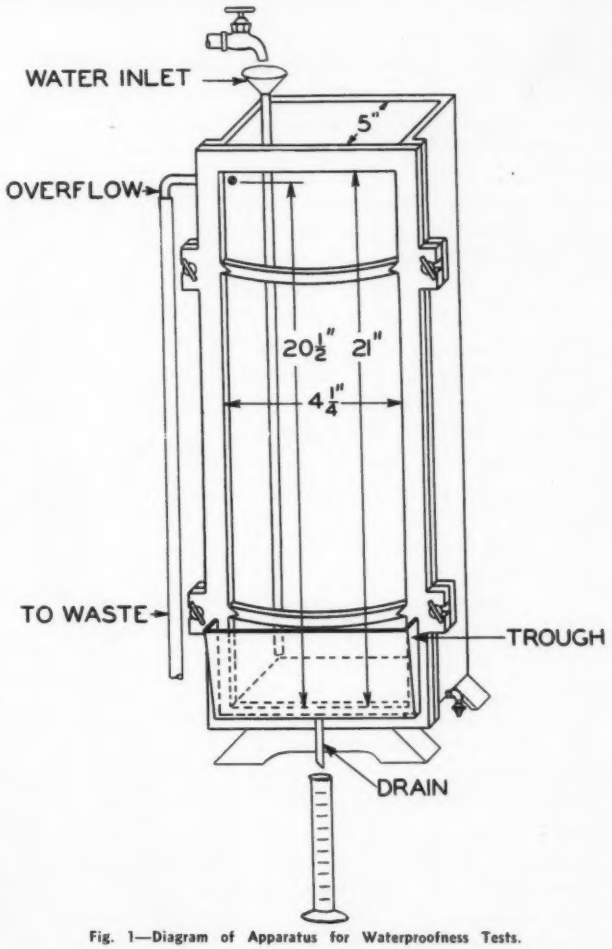

Fig. 1—Diagram of Apparatus for Waterproofness Tests.

water supply valve was adjusted to give a small excess at all times.

The following data were recorded:

(1) The amounts of water which passed through the sample during each of the first five minutes and during the tenth, twentieth, thirtieth, fortieth, fiftieth and sixieth minutes.

(2) The minimum hydrostatic pressure at which leakage occurred at the end of each of those times.

(3) The total amounts of water passed at the end of each of those times.

(4) At the end of the sixtieth minute a sketch was made to show the location of drops or streams where water passed through the sample.

After the above data had been recorded, the water supply was stopped and the box was drained. The sample was marked to show its position in the box before it was removed. In subsequent tests, the sample was placed in the same position. As will be explained below, a shorter test was sometimes used. This test was started in the usual way, the total amount of water which passed

through the sample in 10 minutes was recorded and the test was stopped.

From the data recorded in the above way, item 3 was selected as a basis for grading samples with respect to waterproofness in the present work. The total amount of water which passed through a sample in 60 minutes was first used. Later, it was seen that both unexposed fabrics and fabrics which had been exposed to the weather were rated in the same order on the basis of a 10-minute test as on the basis of a 60-minute test. Accordingly, the total amount of water which passed through a sample in 10 minutes was then used as the basis for grading. This value for different individual samples of the same fabric varied greatly, apparently because the proofing was not uniform. For instance, the total amounts of water passed in 10 minutes by four samples of one fabric (number 36 in Table 1 above) were 72 cc, 50 cc, 126 cc, and 367 cc, respectively. Because of such variations a scheme of classification was adopted, as follows:

Class 1. Fabrics for which the 10-minute total was more than 6250 cc.

Class 2. Fabrics for which the 10-minute total was less than 6250 cc, but more than 1250 cc.

Class 3. Fabrics for which the 10-minute total was less than 1250 cc, but more than 250 cc.

Class 4. Fabrics for which the 10-minute total was less than 250 cc. but more than 50 cc.

Class 5. Fabrics for which the 10-minute total was less than 50 cc. but more than 10 cc.

Class 6. Fabrics for which the 10-minute total was less than 10 cc.

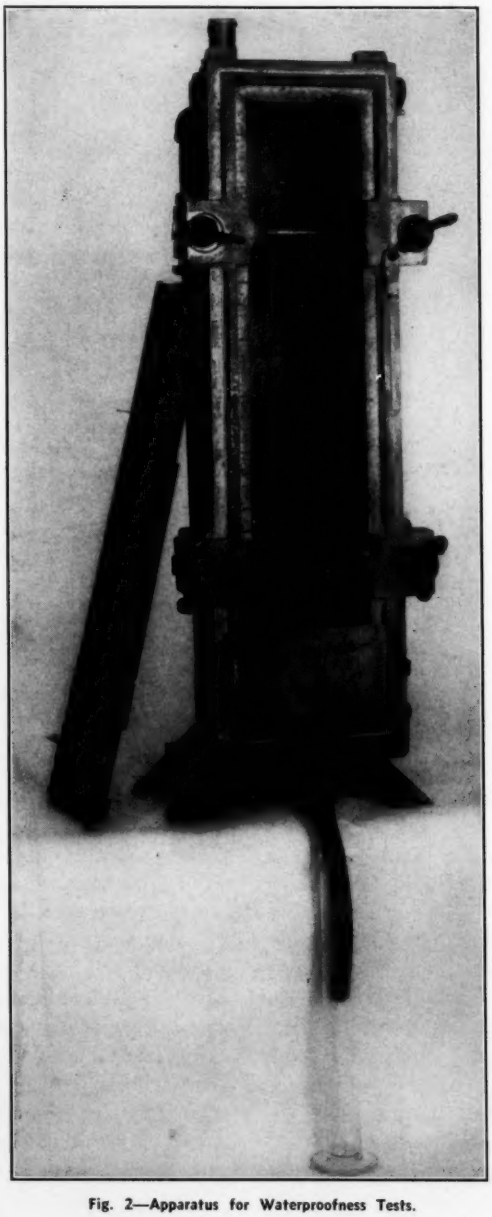

Fig. 2—Apparatus for Waterproofness Tests.

IV. Natural Aging by Exposure to Weather

In order to find a basis for an accelerated aging test, some information on natural aging was needed and this was obtained by exposing samples to the weather and then testing them for waterproofness. This method gave the necessary information as will be shown below.

Two of the tested samples, designated A and B, respectively, from each of the 15 fabrics were exposed to the weather on the roof of the Industrial Building, Bureau of Standards, Washington, D. C., between May 11, 1931, and March 8, 1932. The samples were hemmed at one end so that they could be strung on a line which was supported between uprights. Thus the samples flapped in the wind and were subjected to sun, rain and snow. Each day they were straightened so that the exposure would be as uniform as possible. All the samples were exposed simultaneously one month and then the "A" samples were brought in and tested for waterproofness but the "B" samples were exposed one and one-quarter month longer before being tested. After the "B" samples had been tested, all were exposed again simultaneously two months, tested, and then exposed two and three-quarter months. Thus the total exposures for the "A" samples were one month, three months and five and three-quarter months; for the "B" samples two and one-quarter months, four and one-quarter months and seven months.

The results of the weather exposures are given in Table 2, which shows the waterproofness of samples before and after exposures.

There were eight cases of increase in waterproofness[3] most striking example of which is fabric 31. Samples from this fabric changed from class 2 to class 4 and to class 5 in one month and in two and one-quarter months respectively. The samples then fell into class 4 until after the two longest exposures but even then rated class 3, one class higher than before aging. All other fabrics after the longest exposures were less waterproof than when new. A contrast to fabric 31 is seen in fabric 30,

which dropped from class 4 to class 1 in the shortest exposure (one month) and was among the least waterproof of all after the longest exposures. As stated above, these two fabrics were both waterproofed with the same kind of material but, as noted in Table 1, fabric 30 was of lighter and cheaper construction and contained a larger proportion of proofing material than fabric 31.

TABLE 2

Waterproofness

(*Class 6 is the highest, class 1 the lowest. See scheme of classification under "III. Method of Test for Waterproofness."*)

Serial Number	Before Aging A and B	After 1 Mo. A	Natural Aging 2¼ Mos. B	Aging 3 Mos. A	(Weather Exposures) 4½ Mos. B	5¾ Mos. A	7 Mos. B	After Accelerated Aging
25	3	3	4	4	4	2	2	3
26	5	6	6	6	5	4	†	6
27	1	2	2	2	2	1	1	1
28	4	3	3	3	3	1	1	2
29	2	2	2	2	2	1	1	1
30	4	1	2	1	2	1	1	1
31	2-3*	4	5	4	4	3	3	3
32	2	2	3	2	3	1	1	2
33	3	2	2	2	2	‡	‡	2
34	6	4	6	4	4	4	4	6
35	4	2	3	3	2	1	‡	2
36	4	3	3	4	3	2	2	2
37	2	2	2	2	3	2	2	2
38	5	5	5	5	5	3	3	3
39	6	6	6	6	6	4	3	4

* The sample used for accelerated aging was in class 3 before aging but the two samples used for natural aging were in class 2.
† The sample could not be tested because of holes (See text).
‡ The sample had frayed so badly that it could not be tested.

After the longest weather exposures, fabric 34 was more waterproof than any other, while fabric 29 was poorest of all. Fabric 26 showed marked deterioration in a different way. During all the exposures up to the longest, it retained its waterproofness very well as seen in Table 2. After the longest exposure, there were such large holes in the sample that it could not be tested. Both warp and filling threads were broken in places where the sample had been repeatedly creased by flapping in the wind. Evidently the waterproofing material used on this fabric had good resistance to weather but contributed in some way to relatively rapid deterioration of the cotton.

After the exposures, waterproofness tests showed that some fabrics were good, some were intermediate and some were poor and thus a basis for judging an accelerated aging test was provided.

V. Accelerated Aging Test

Samples from the 15 fabrics, duplicates of the sample subjected to natural aging, were tested for waterproofness and then treated in the laboratory in attempts to simulate the effects of weather exposures. Since waterproofed ducks and similar fabrics in use are subjected to sunlight and rain and to folding, crumpling and distortion, it appeared that light exposure, wettting and drying and mechanical flexing and distortion would be necessary parts of a laboratory accelerated aging test. An enclosed carbon arc lamp was used for the light exposures. For the mechanical treatment, a machine was built in which the sample can be flexed, rubbed and distorted while it is dry or while it is wet.

The light exposures were made in the Weather-Ometer (manufactured by the Atlas Electric Devices Company, Chicago, Ill.). A 220-volt glass-enclosed carbon arc lamp is suspended in the center of an upright metal cylinder 30 inches in diameter and 17 inches deep. The sample holders for small samples which are fixed to the inside circumference of the cylinder were not used. Instead, an aluminum cylinder was fitted inside the sample holders so as to provide a smooth surface to which the relatively large samples of waterproofed fabrics were fastened. The samples were 14⅝ inches from the center of the arc and the long axes of the samples were at the level of the center of the arc.

Figure 3 is a diagram giving essential details of the mechanical aging machine and Figure 4 is a photograph of it in its original crude form. It consists of a crank with two connecting rods, each of which terminates in a clamp for one end of the sample. The sample passes under a thin bar of ordinary strap iron which is mounted edgewise in a frame. The frame is controlled by guides

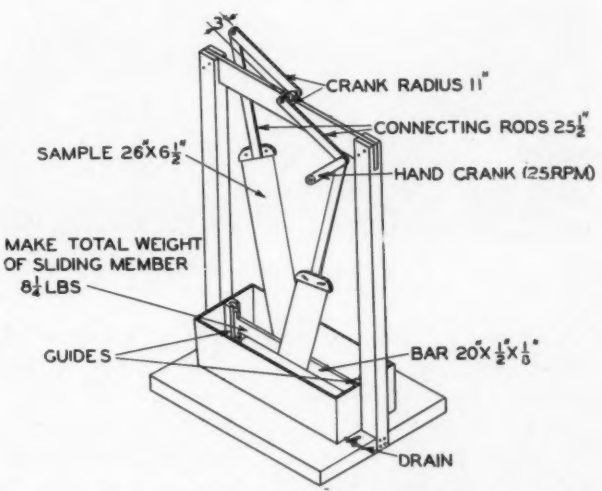

Fig. 3—Diagram of Mechanical Aging Machine.

so that it is free to slide up and down with the bar always horizontal and always pressing down on the sample. As the crank is turned through a complete revolution, the sample is drawn back and forth under the weighted bar so that flexing, rubbing and distortion of the sample result. When a wet treatment of the sample is given, a small tank is placed under the bar and filled with water so that the bar is always under water. In the present work, the crank was turned at the rate of 25 r. p. m. and the total weight pressing down on the sample was 8¼

pounds. This is the weight of the bar and its frame plus two 500-gram weights, one on each of the brass pans shown in the photograph.

The laboratory aging cycle was as follows:

A sample 26 by 6½ inches in size, cut with the long dimension in the filling direction, which had been tested for waterproofness and then allowed to dry in the air was exposed for 45 hours to the radiation from the 220-volt enclosed carbon arc lamp at a distance of 14⅝ inches. The sample was allowed to cool to room temperature and

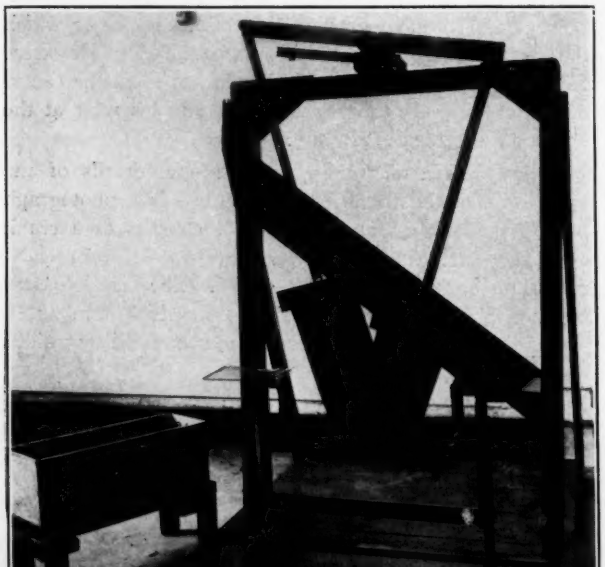

Fig. 4—Mechanical Aging Machine.

was retested for waterproofness by the method described above. The sample was again dried in the air. It was treated in the mechanical aging machine for 400 revolutions (16 minutes) dry and then for 400 revolutions wet. The sample was then allowed to dry in the air, tested for waterproofness and classified.

VI. Comparison of Accelerated with Natural Aging

Samples from the 15 fabrics were subjected to the accelerated aging test as described above. The results are shown in Table 2 together with the results of natural againg or exposure to weather. Results are expressed in terms of the classification described above under the method of test.

It is seen from Table 2 that for 7 fabrics (numbers 27, 29, 30, 31, 36, 37, 38) the accelerated aging test led to the same results as did the seven months' weather exposures. For the other fabrics the accelerated aging test evidently was relatively less severe since it led to classifications which in most cases were one or two steps higher than after seven months' natural aging. For fabric 26, although the accelerated aging test gave no indication of the formation of holes which occurred in weather exposures, the high rating after accelerated aging is partly justified by the high ratings after the shorter weather exposures.

In general, the fabrics which natural aging shows to be of good quality are shown by the accelerated aging test to be of good quality and in a similar way the accelerated aging test distinguishes fair fabrics and poor ones. Therefore, it is believed that the test will be useful in the evaluation of waterproofed ducks and similar fabrics. Further development of the test probably will require laboratory trials of a large number of fabrics whose relative serviceability has been established by actual use.

VII. Acknowledgment

The principle used in the mechanical aging was suggested by W. D. Appel, Chief of the Textile Section, Bureau of Standards, whose direction the work was done. The machine was designed and built with the advice and assistance of R. T. Mease, Associate Scientist, Textile Section. The physical tests and many of the waterproofness tests were made by members of the Testing Section, Division of Organic and Fibrous Materials, Bureau of Standards.

REFERENCES

[1]Publication approved by the Acting Director of the Bureau of Standards of the U. S. Department of Commerce.

[2]Research Associate at the Bureau of Standards for the American Association of Textile Chemists and Colorists.

[3]Increases in waterproofness on exposure to weather have been reported by others:

First Report of the Fabrics Co-ordinating Research Committee, pages 54-61, especially table 17, page 61. (Published by His Majesty's Stationery Office, London, 1925.)

Veitch and Jarrell, Ind. Eng. Chem. *13*, pp. 672-6, especially second paragraph, page 674 (1921.)

NOVEMBER MEETING, NEW YORK SECTION

THE regular monthly meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday evening, November 18, 1932, at the Chemists' Club, 52 East 41st Street, New York City, Henry F. Herrmann, Chairman of the Section, presiding.

The meeting convened at eight-fifteen o'clock.

Mr. Hager, representing the Unemployment Relief Committee, addressed the meeting and asked for the cooperation of the members and their financial assistance.

The routine business of the Section was than transacted.

Chairman Herrmann: If there is no other business to come before the Section, and if there are no questions concerning what has preceded, we will go on to the technical part of the program.

Gentlemen, the rather flattering turnout tonight I should say is a sign of the interest in the subject which we have selected for discussion tonight. It is rubber. Rubber is an old material. It dates back much further than I would dare to guess and yet today it is surrounded with much mystery. I am hoping that our speaker tonight, Mr. Hauser of the Revertex Corporation, will enlighten us on the topic, and I take great pleasure in introducing him to you.

Mr. W. J. R. Hauser of the Revertex Corporation of America will talk on "New Developments in the Rubberizing of Fabrics." Mr. Hauser! (Applause.)

Impregnation of Textiles With Latex*

By W. J. R. HAUSER
Revertex Corp. of America, New York, N. Y.

I WISH to thank you for the great honor you have accorded me by your invitation to read a short paper before you tonight.

The applications of rubber latex in the textile industry are so numerous and vary so much that I have decided to restrict myself tonight to one problem only—namely, the problem of impregnation of textiles with rubber latex. The general use of rubber latex in combination with textiles is probably at least as old as our entire knowledge of the existence of this unique substance known to you as "rubber." We already find references to coating, waterproofing and doubling of fabrics with rubber latex in the narratives of the first French and Spanish explorers of South America, dating back to the first years of the sixteenth century. Waterproofed garments and a type of canvas shoe produced by the West Indian natives with the use of rubber latex were brought to Europe in the eighteenth century. It has also been found that the natives of South America knew the value of sulphur and accelerating chemicals when admixed to rubber latex and then drying the deposited film in the sun long before "vulcanization" was actually discovered by Goodyear.

If you ask me why under these circumstances latex has not been used to a far greater extent in combination with textiles up to date, I think the best reply is the following:

Latex as it comes from the rubber tree is a rather unstable liquid which could not be stored or transported for any length of time. When finally ways and means of preserving latex with ammonia or the like became known in 1853 the rubber industry had already progressed too far on other lines, such as naphtha solutions of rubber, and consequently owing to the extra freight on latex caused by its water content, the use of latex was not sufficiently interesting to the somewhat conservative rubber industry. This situation only changed a few years ago when it was found possible to make bulk shipments of latex as well as to concentrate latex. Latex now became available in larger quantities but still the industries concerned hesitated to make immediate use of the increased latex supply. I have often wondered what might be the actual reason for this attitude. It could not possibly be pure conservatism and there were no really serious patent situations to be overcome, but there was one point which sometimes has been mentioned to me as a most serious drawback when using latex. If latex or latex compounds are applied to a fabric the resultant rubber film can be peeled off the fabric base more or less completely and fairly easily. This observation has stood in direct contrast to literature and patent references where it is claimed that latex allows a far more complete impregnation than is possible with, e.g., rubber-naphtha solutions.

Very thorough researches into the question of impregnability of textiles with latex have recently definitely proved that the observations of the practical man in the factory are correct and that the statements in literature are the results of erroneous assumptions. If plain latex of suitable concentration, which may or may not contain vulcanizing ingredients, etc., is used for impregnation purposes, we will find, that all we get is a more or less uniform coating but *no* penetration of the rubber into the inside of the fiber.

*Paper read at meeting of the N. Y. Section, November 18th, 1932.

The following slide will show you such a coating of rubber latex on a single cord. The next slide will show you the result of a sulphuric acid treatment onto this piece of cord. The cotton which was only covered but not impregnated was removed by the sulphuric acid treatment. Of course, when using cords of a loose twist it is possible to deposit rubber between the strands to some extent as you can see on the following slide. However, such a procedure not only reduces the maximum strength of the cord but it cannot by any means be compared with an actual impregnation of the individual fiber such as is achieved, for example, with a naphtha solution. The following slide shows a cord impregnated with a naphtha solution and then treated with sulphuric acid. You will note that the entire cord has resisted the action of the sulphuric acid and is rubberized.

You will now ask me why such importance is attached to the use of rubber latex in combination with textiles. The reason is the following:

Rubber when masticated undergoes a molecular disaggregation coupled with an oxidization process. The molecular size of the hydrocarbon in its natural state is decreased resulting in rubber of greatly decreased elasticity and strength. The following step of dissolving the rubber in naphtha will further disaggregate the hydrocarbon and brings about the well-known adhesive properties of naphtha solutions. These adhesive properties will only disappear after vulcanization has been completed.

On the other hand, the unchanged strength of latex rubber, its excellent ageing properties, etc., would make it a most valuable liquid for impregnating purposes, provided, of course, that complete impregnation could be assured. The use of rubber latex, owing to its somewhat hygroscopic properties would also permit the retention throughout the fiber of a far more uniform moisture content which as you know is to a certain extent essential for the maintenance of the original strength of the fiber. The Colloid Chemical Laboratory of our organization in Europe is just about to publish in the "Transactions of the Institution of Rubber Industries"—London, England, the first results of very systematic researches toward complete impregnation, without the use of any special or complicated machinery, of cords or finished woven fabrics with rubber latex.

They have been able to ascertain that the degree of impregnability depends largely on the surface tension of the applied latex. Increased penetrability is therefore obtained if substances of high surface activity are added to the latex such as certain wetting agents of the Nekal types. Substances which have an opening-up effect on the fiber itself or which have a dissolving influence on the water-repelling properties of certain ingredients present in the fiber are even better. The following slide will show you a micro-photograph showing a single cord impregnated with Revertex containing a very small amount of Praestabit-oil. Although the degree of impregnation is found to be considerably improved the single threads making up the cords have remained untouched and could be removed by a sulphuric acid treatment. The second photograph on this slide will show you a complete impregnation of the cord achieved by increasing the amount of wetting agent added to the latex. The next slide shows a cord which has been impregnated with Igepon solution and which has then been passed through a latex bath. The cord has been opened up but each individual thread is completely impregnated with latex. The last slide shows you a completely impregnated cord. For this impregnation was used a compound consisting of the concentrated rubber latex known as Revertex and Igepon A. This result could certainly not be anticipated considering the many failures which have been reported so far.

I hope that these results will have convinced you that the combined knowledge of latex and textile colloidal chemistry have enabled us to solve an important problem and have removed the obstacles in the way of using latex in general for impregnating, waterproofing and other processes in combination with fabrics, etc.

As I mentioned before, some papers regarding the impregnation of fabrics with latex will appear in the near future in the "Transactions of the Institution of Rubber Industries" as well as in the German trade journal "Kautschuk." These articles will probably also appear at a later date in our trade journals. In the meantime if any of you gentlemen wish to receive some further detailed information regarding the application of latex to textiles, I will be only too glad to give any information I have available on this subject if you will drop me a line at my office at 40 Rector Street, New York.

Discussion

After Mr. Hauser presented his prepared paper, illustrating with slides, he made the following extemporaneous remarks:

Mr. Hauser: These samples represent some products which have been made with Revertex or Latex and fabrics.

This is a friction belt which has been made solely and completely with Revertex and canvas.

This is a carpet of the Axminster type which is actually being manufactured in this country with Revertex and the reason for rubberizing the back is to keep the tufts in place, to increase the weight of the carpet, or in other words, to make a good rug out of a cheap one.

Waterproofing of ordinary canvas for automobile topping and other materials of that type can easily be achieved by the use of rubber latex.

This is a French process of applying flocked wool and silk or flocked cotton to a fabric base by using rubber latex as a binding medium. You will find in this country

similar products for which naphtha solutions have been used for quite a number of years past. However, the French concerns manufacturing this type of fabric claim that with the use of latex you can obtain much better results than with the use of naphtha solutions.

The automotive industry is using upholstery material which is rubberized on the back. The rubberizing serves to hold the tufts in place, strengthens the material in general, and partly waterproofs it. This type of fabric is being used today to a large extent by the General Motors Company and other automobile manufacturers.

One of the largest fields for latex in this country is in the doubling of fabrics. Doubled fabrics are used extensively in the manufacture of shoes as well as in the manufacture of automobile tops, artificial leathers, and similar products. I will pass this book around if you care to look at the samples.

If there are any questions you would like to ask I shall be pleased to answer them. However, I am not a chemist and the lecture just given you is the result of a compilation of our laboratories and if there are any very scientific questions, I might get stuck and have to ask you to please excuse me.

Thank you. (Applause.)

Wetting Agent

Mr. North: I should like to ask, if it is permissible, the chemical nature of the wetting agent. Is it permissible to inquire as to that? I didn't get the trade name or the chemical name of the wetting agent that you spoke of.

Mr. Hauser: The wetting agent? Do you mean Igepon?

Mr. North: Yes.

Mr. Hauser: The material, Igepon A, is manufactured by the General Dyestuff Corporation in this country and you will have to ask our Chairman to explain it.

Chairman Herrmann: Mr. North, do you mean you wish to know the nature of the Igepon?

Mr. North: If it is permissible to ask. I don't want to ask any questions that are improper.

Chairman Herrmann: It is a fatty ester, of a sulphonated fatty content. When I say it is a sulphonated aliphatic compound, in a general way I have reference to the series of articles that have been very much discussed in the trade papers of late, referred to as the sulphonated fatty alcohols. So it belongs in that general group.

Mr. North: Thank you.

Chairman Herrmann: Gentlemen, are there any further questions? I hope that Mr. Hauser has touched on sufficient matters of interest to arouse a good deal of discussion.

Vulcanizing Agent

Mr. Mosher: I should like to ask what vulcanizing agent is used for latex.

Mr. Hauser: As a rule, it depends on the type of fabric—a fast accelerator, such as DuPont's 552 or Vanderbilt's Captax, and Tuads, DuPont's 833, or I. G. Vulkacit P, Vulkacit 774, or Vulkacit CT.

Mr. Mosher: Is sulphur used in conjunction with it, too?

Mr. Hauser: Yes, approximately 1½ to 2 per cent on the solid rubber. You have to use zinc oxide, too, as an activator.

Drying

Mr. Hogen: Is there any difficulty in drying latex?

Mr. Hauser: Latex, in general, will dry slightly less quickly than naphtha solutions because naphtha will evaporate more readily than water.

Mr. Hogen: Do you use cans?

Mr. Hauser: Yes, it is preferable to use drying cans or drums, but you can obtain drying on a long drying table.

Mr. Hogen: Is there any difficulty from the material adhering to the cans?

Mr. Hauser: No, the rubberized surface is turned away from the can.

Mr. Hogen: You turn it away?

Mr. Hauser: Yes. If you put the rubber in direct contact with the can it will stick to the can.

Rayon

Mr. Freedman: Have you been able to impregnate rayon with latex?

Mr. Hauser: As far as rayon is concerned, that is one of our most difficult problems, and so far I don't know of any experiments that have been carried on with rayon.

Patents

Mr. Levin: I should like to ask Mr. Hauser if there is any patent situation that would make it impossible to use Revertex for any of these processes that he has mentioned?

Mr. Hauser: The patent situation in America is rather complicated. At one of the last rubber sessions, a speaker got up and said the patent situation as far as latex was concerned was such that you practically could not pour latex from one beaker to another without infringing upon at least twenty patents.

I don't think the situation is quite as serious as that but there are quite a lot of patents which you will have to take into consideration when using latex. As far as the validity of the patents is concerned, I can't say whether they are valid or not.

Mr. Levin: I refer specifically to that pile fabric.

Mr. Hauser: There are a number of patents referring to pile fabrics. How good they are, I can't say.

Vulcanization

Chairman Herrmann: I should like to ask Mr. Hauser a question and that is with reference to the vulcanization. That is a rather imposing term. What do you have to do in order to vulcanize the rubber on the back, merely dry it?

Mr. Hauser: Well, in order to vulcanize you must first dry and then expose to heat. There are certain accelerators which are very rapid and which will practically cure, or vulcanize, at room temperature if allowed to stand for a day or two. But, in general, you are supposed to expose the dried rubberized surface to a certain temperature for, say, ten or fifteen minutes and vulcanization will be completed. The temperature depends entirely on the accelerator used and the length of time of exposure.

Chairman Herrmann: In the rubberizing of a fabric such as you exhibited here, of an automobile mohair type, is there any harmful effect on the durability of the mohair, or the wool contained in the fabric, due to the application of the rubber?

Mr. Hauser: Do you mean whether the rubber affects the mohair?

Chairman Herrmann: Either the rubber or the vulcanizing process.

Mr. Hauser: Do you mean rubber latex?

Chairman Herrmann: Yes.

Mr. Hauser: As far as rubber latex is concerned, if the fabric is not affected by a slight alkalinity the fabric will not be affected by vulcanization. Of course, certain types of fabric are affected by heat. For fabrics of that type it is recommended that you use a rapid accelerator and not too much heat.

Chairman Herrmann: Is it customary to dye these materials after the rubberizing?

Mr. Hauser: No, before rubberizing.

Chairman Herrmann: The rubber is applied before?

Mr. Hauser: No, the rubber is applied afterwards.

Chairman Herrmann: After the dyeing?

Mr. Hauser: Yes.

Chairman Herrmann: And it doesn't affect the colors?

Mr. Hauser: No, providing the colors resist alkalinity and heat.

Behavior to Light

Chairman Herrmann: Just one more question.

I saw not long ago a Fade-Ometer test on a piece of rubberized automobile plush, and the behavior to light seemed to be somewhat different than that of a similar fabric dyed in identical manner where rubber was not present. Is that a common experience, or is that unusual?

Mr. Hauser: No, that is not usual. Probably the particular fabric was colored with some material which did not go well with alkali and the alkalinity may have affected the color.

Chairman Herrmann: The material was all finished and it was exposed in this Fade-Ometer, which is just a light exposure. The only thing that suggested itself was that possibly the rubber itself might tend to sublime or that the vulcanizing agent might sublime, or that something else would discolor the wool and turn it brown.

Mr. Hauser: The rubber itself could not do it. Did you say it turned brown?

Chairman Herrmann: Yes, I had seen a piece of undyed mohair, that is, in the natural state, exposed and the part that had been exposed in the Fade-Ometer turned brown.

Mr. Hauser: Possibly the sulphur content in the rubber mixture was too large and went into the mohair.

Chairman Herrmann: That is what I thought.

Mr. Hauser: The rubber as such could not affect the color of the mohair.

Chairman Herrmann: But the sulphur might?

Mr. Hauser: If there was a surplus of sulphur there could be a certain amount of that effect.

Mr. North: I should like to ask another question. Is it possible to first vulcanize latex and then apply it?

Mr. Hauser: Yes. You can vulcanize latex according to patents which are owned by Professor Schidrowitz of London and over here promoted by the Vultex Corporation, in Cambridge, Massachusetts. They produce a latex which has been pre-vulcanized, or vulcanized in the liquid state. Then you can apply this vulcanized latex to the fabric.

Mr. North: How do those products compare with the products you have just shown us?

Mr. Hauser: Well, I don't know. I mean the finished, dried fabric or dried rubber film of a pre-vulcanized latex and a latex vulcanized afterwards should be practically identical.

Paper

Mr. Kingman: To change the subject just a bit, have you ever tried using this on paper, impregnating paper with your product?

Mr. Hauser: Yes.

Mr. Kingman: Does it impregnate the paper thoroughly?

Mr. Hauser: A finished paper?

Mr. Kingman: Well, say, a blotting paper.

Mr. Hauser: Yes. I mean you have to process according to certain methods in order to get the latex to penetrate right through the fiber. For example, if you

use a vacuum and impregnate in a vacuum you will be able to get the latex through the fiber, whereas if you don't use a vacuum it will simply stay on the surface and the water will penertate, but not the rubber.

Application to Fabrics

Mr. North: How is vulcanized latex applied to cloth?—

Mr. Hauser: To fabrics?

Mr. North: Yes.

Mr. Hauser: It is usually applied with a spreading knife—with a doctor blade.

Mr. North: In other words, semi-liquid?

Mr. Hauser: It is in paste form, like a thick cream. You can use it in the same way as you would use ordinary cement.

Mr. Stein: What are the advantages?

Mr. Hauser: Well, we claim the ageing qualities are better and there is no danger of inflammability. There is no gasoline in it, and you can apply, with two or three coats, approximately the same amount of rubber as with 10 or 12 of the naphtha solution.

Mr. Stein: In order to vulcanize latex you have to draw the water off and it becomes a solid mass. How do you again form that into a pasty solution?

Mr. Hauser: We don't. We take rubber latex and compound it with the necessary ingredients—

Mr. Stein: Don't you have to use a solvent afterwards?

Mr. Hauser: No. You take the rubber latex, which is a paste or liquid—

Mr. Stein: It is no longer a paste after the water is drawn off.

Mr. Hauser: Yes, but it is before you rubberize.

Mr. Stein: But in order to cure it, you have to drive the water off.

Mr. Hauser: But you don't cure until after it is applied to the fabric.

Mr. Stein: The question was asked whether the latex can be cured before it is applied.

Mr. Hauser: You can cure latex, according to the patent I mentioned before, in liquid form.

Mr. North: Perhaps if you stated "rubber particles" it would make it clearer to him.

Mr. Hauser: If you follow the patent of Schidrowitz you can vulcanize each individual latex particle, and yet keep it in a liquid form.

Mr. North: That is what I meant.

Mr. Hauser: And then if you use that process you have a liquid vulcanized rubber which if applied to fabrics, and the water driven off—

Mr. Stein: The liquid is composed of ammonia, or—

Mr. Hauser: In vulcanized latex there is some ammonia, as far as I know, for stabilizing purposes—

Mr. Stein: Has the vulcanized latex the same power of impregnation?

Mr. Hauser: The vulcanization itself has nothing to do with the impregnation. The impregnation with latex, and Vultex as vulcanized latex is called, is probably the same.

Mr. Stein: Probably the same?

Mr. Hauser: As far as we know, it is the same. We didn't experiment with Vultex.

Dr. Jos. F. X. Harold: I should like to know if Van Rossem agrees with you, or if any of these people who have fussed with latex in a highly scientific way have found any relation between the degree of penetration and the size of the particle.

Mr. Hauser: The reason for the inability of ordinary latex to penetrate into fiber is probably because the individual latex particle is larger than the fiber, and consequently it is impossible to get the latex particle to enter the individual fiber.

Dr. Harold: Is that still the case? Can't they get it fine enough?

Mr. Hauser: We found that by using a wetting agent like Igepon we can obtain penetration into the fiber.

Dr. Harold: Then the individual particles must be smaller than the fiber?

Mr. Hauser: That is a point which I shouldn't like to answer.

Dr. Harold: The only reason I asked was that in the turkey red oil industry it was found that if the particles were a micron or smaller, it would act like just so much water, and there seemed to be no tendency to adhere or to depict upon fiber, but that when the turkey red particles were between one micron and ten there was a distinct absorption of the oil product in the fiber, and I was wondering if a similar action had been noted by you or other workers as to the particle size or degree of penetration.

Mr. Hauser: I couldn't tell you.

Para Rubber

Mr. Ephraim Freedman: What has been your experience with Para rubber as compared with plantation rubber?

Mr. Hauser: You cannot obtain Para latex. We tried to obtain Para latex for experimental purposes, but it is practically unobtainable. As a matter of fact, today there is hardly any Para used. Practically all rubber used today is plantation rubber because Para is much too expensive to produce, with present rubber prices.

Protective Colloid

Mr. Levine: I should like to ask Mr. Hauser, is it necessary to add a protective colloid to the Revertex?

Mr. Hauser: Not for normal purposes. If you compound a lot of carbon black or things of that sort into it, which are liable to coagulate the Revertex, then you have to add a protective, or preserving agent let us say, to prevent coagulation.

Mr. Levine: The material as it stands—

Mr. Hauser: The material as it stands is sufficiently stable to be used without any other ingredient being added.

Mr. Stein: By latex, you mean the milk of latex?

Mr. Hauser: Yes.

Mr. Stein: That in itself answers the question that it cannot be Para rubber, because it is the milk of latex.

Mr. Hauser: Para rubber comes from the same tree, botanically speaking, the Hevea Brasiliensis.

Mr. Stein: Para is wild rubber.

Mr. Hauser: But Para rubber comes from the Hevea Brasiliensis, which is the same tree that plantation rubber comes from, only—

Mr. Stein: It is in the family but it is not the same tree.

Mr. Hauser: It is positively the same.

Mr. Levine: I think he misunderstands the expression.

Mr. Hauser: Rubber latex as it comes from the rubber tree is the same in Brazil and Malay. What you call latex over here is a crepe rubber.

Chairman Herrmann: What does the term "plantation" mean?

Mr. Hauser: Para rubber comes from Brazil. The original rubber was Para rubber. It came from the Amazon River and Para, and the original botanical tree is the tree which was exported to Malay and planted on plantations, and it is from that tree that we get plantation rubber. But the botanical tree is the Hevea Brasiliensis.

Chairman Herrmann: I mean, aside from the economic question, would it be possible to tap latex from any rubber tree?

Mr. Hauser: Oh, yes, but it doesn't pay to tap it in Brazil.

Chairman Herrmann: It is an economic question and not a chemical or botanical one, and you say the term "latex"—

Mr. Hauser: The term "latex" as a rule is understood to mean liquid rubber latex as it comes from the rubber tree, but over here "first latex crepe" is a coagulated rubber which is in a yellow form and looks something like crepe soles. This rubber is very frequently termed here "first latex," which, as a matter of fact, causes the Department of Commerce a lot of inconvenience because some importers term their product latex and the Department of Commerce puts it in as liquid latex, and then there is great confusion in the statistics.

Mr. Stein: The confusion has been caused because latex has at all times been recognized as a thin, pale crepe—

Mr. Hauser: First latex crepe is understood or recognized here as a thin pale crepe, whereas liquid latex is the original latex, including the water.

Mr. Stein: No, including ammonia, in other words, using ammonia water instead of benzine solvent.

Mr. Hauser: No, latex contains water as it comes from the rubber tree, about 60 per cent.

Mr. Stein: Yes, but dissolved in ammonia.

Mr. Hauser: No. There is ammonia added to preserve it. It is added for preserving purposes. If you don't add ammonia or some similar article it will coagulate and it will be crude rubber.

Thin Films of Latex

Mr. Miller: Mr. Hauser, most of these fabrics are rather heavy affairs and rather thick. May this latex be applied in a film thin enough to properly waterproof a very delicate fabric like a georgette?

Mr. Hauser: In Europe it is being used for that purpose. Over here there doesn't seem to be much interest in it. The reason is that a very thin fabric covered with latex will not show as smooth a surface as one covered with gasoline cement, for the time being, and the reason is that if you heat-cure rubber latex, which you must do to obtain proper vulcanization, the surface will not be quite as smooth as you obtain with gasoline.

Mr. Freedman: Is it possible to disperse solid rubber and then apply it in viscous form?

Mr. Hauser: Oh, yes, but I don't think it would pay, with rubber at three and a half or four cents a pound.

Mr. Freedman: Is there any advantage in applying it because of its being viscous or thicker, I mean the solid rubber itself in dispersion as compared with the application of rubber latex?

Mr. Hauser: No. Of course, you can disperse reclaimed rubber—old tires and tubes ground up. You can disperse that, and then you will obtain an entirely different product than rubber latex. Reclaimed dispersed rubber is a rubber which has been masticated and ground and otherwise treated and then dispersed, whereas rubber latex is absolutely as it comes from the rubber tree, without being masticated or treated in any other way. Probably, therefore, the rubber from rubber latex will be very much superior to the rubber from dispersed crude rubber.

Hygroscopic Qualities

Mr. Freedman: The second specimen of yours that passed through my hands here this evening felt a little sticky to the touch.

Mr. Hauser: You will find some fabrics which are slightly sticky to the touch, because latex is slightly hygroscopic.

Mr. Freedman: Can that be overcome?

Mr. Hauser: Yes, that can be overcome.

Mr. Freedman: By coating materials?

Mr. Hauser: No, by simply dusting the surface in the ordinary way that any rubber coat is dusted.

Mr. Freedman: But supposing that during the use of the fabric the coating had been removed?

Mr. Hauser: It won't be removed.

Mr. Freedman: It cannot be removed?

Mr. Hauser: No.

Mr. Freedman: I have seen some rubberized raincoats that when they first came into stock were coated with a powder, and after being in use for a short period of time and being subjected to the action of perspiration, which condenses during the wearing of the garment, the coating wore off with the result that the coats became gummy.

Mr. Hauser: I don't know why that should be. It is probably caused by deterioration of the rubber, like in a shower curtain.

Mr. Freedman: The rubber itself seems to be able to resist a 60 per cent benzol test and chemical examination for excessive amounts of copper show negative, that is, the amount of copper is well within the limits. Sometimes the amount of manganese is a little more than is supposed to be present but otherwise it appears to be all right.

Mr. Hauser: Any rubber will start to deteriorate if exposed to body temperature and the longer it is exposed to that heat and temperature the faster it will deteriorate.

Mr. Freedman: That doesn't quite hold true with respect to all types of rubber. I have a rubberized raincoat which has been in use for the past five years and the rubber itself appears to be holding up very well.

Mr. Hauser: Then the other raincoat wasn't vulcanized properly.

Mr. Freedman: If that is so, wouldn't that show up under the benzol test?

Mr. Hauser: No.

Balata

Mr. North: May I ask if you have applied your process to the latex of such trees as the elastica, guttapercha, and how about some of the Castilloas?

Mr. Hauser: The only other type with which we are experimenting is Balata.

Mr. North: Balata works very well.

Mr. Hauser: It works all right but it is difficult to obtain liquid Balata, and get it to Europe in liquid form.

Mr. North: I have seen some very nice Balata that come to this country solid and was dispersed.

Mr. Hauser: We haven't experimented with that at all.

Mr. North: Many years ago I made a good many thousand pounds of Balata belting.

Mr. Hauser: You can obtain Balata in liquid form from the trees.

Mr. North: It isn't commercially done, but at least it can be done. It can be done, but it is very difficult.

Rubber Tires

Chairman Herrmann: I should like to ask a question. In the manufacture of rubber tires, do they use latex, that is, the liquid latex?

Mr. Hauser: It is used to some extent in tires, yes.

Chairman Herrmann: It is possible to build up this great thickness.

Mr. Hauser: No, no! The outside?

Chairman Herrmann: Yes.

Mr. Hauser: You can make the outside of the tire with latex but it is a rather expensive proposition because you probably have to compound the latex with the carbon black and other ingredients, and then masticate in the ordinary way. There is no advantage in using latex for that purpose.

Chairman Herrmann: When these tire concerns talk about latex, they mean it is used only for the cord?

Mr. Hauser: Yes, for the cord fabric.

Chairman Herrmann: And then the thread is laid over that?

Mr. Hauser: Yes.

Chairman Herrmann: I see. It is bonded, too, and it is a separate operation?

Mr. Hauser: Oh, yes. The cord of the tire can be impregnated with latex. As a matter of fact, U. S. Rubber Company is doing that.

Chairman Herrmann: I was wondering whether these advertisements of the rubber concerns referred to a complete latex pocess.

Mr. Hauser: No, just to the cord.

Mr. Stein: That process was adopted simply as a convenience, more than an innovation. Instead of using ordinary cement to spread the cord, in order to form an adhesive medium, they use latex which is more readily handled.

Anti-Oxidants

Mr. Levin: Do you recommend the use of an anti-oxidant with Revertex?

Mr. Hauser: For some purposes, yes.

Mr. Levin: And that is introduced in the form of a dispersion?

Mr. Hauser: You can get anti-oxidants that will readily mix with latex.

Mr. Levin: As a soluble?

Mr. Hauser: As a soluble or in dispersed form, or it can be admixed in powdered form.

Mr. Levin: But for normal uses anti-oxidants aren't indicated?

Mr. Hauser: There are anti-oxidants by DuPont—I think one is called Aquarex and one is called Neozone L—which are water dispersions and all you have to do it to admix about two per cent (on the rubber solids) and you obtain the ageing properties you desire.

Mr. Levin: But for normal uses, some of these samples appear to be canvas waterproofed—would they require any anti-oxidant for exposure?

Mr. Hauser: No.

Mr. Levin: And they weather?

Mr. Hauser: Yes. The reason the anti-oxidant is used is mostly to preserve the rubber against weather, etc.

Mr. Levin: If you were just to apply the latex to the exposed surface, could you expect any life?

Mr. Hauser: Single texture?

Mr. Levin: Yes.

Mr. Hauser: Well, you can add an anti-oxidant but it is not absolutely necessary because latex as such contains quite a number of natural non-rubber constituents which act as anti-oxidants.

Germicides

Mr. Freedman: Have you heard of any germicidal properties attributed to rubber or rubber coated products?

Mr. Hauser: There is one material used by us called "Preventol," which is manufactured by the I. G. in Europe and General Dyestuff over here, but otherwise we have never used anything like that.

Mr. Stein: Where was it used, may I ask?

Mr. Hauser: We have experimented with it in our laboratories as a germicide, to prevent deterioration of the rubber.

Mr. Stein: You are just experimenting with that?

Mr. Hauser: Oh, yes. It is not being used in actual production.

Gums

Mr. Hogen: If you wish to add a gum to latex are there any particular gums that you find better than others?

Mr. Hauser: We have been using quite a lot of gum karaya. Gum karaya will increase the viscosity considerably and furthermore if you use a compound containing a little rubber only and a lot of fillers—cheap compounds in other words—and you use gum karaya you can add ever so much whiting or chalk or materials of that sort and still obtain a smooth surface.

Mr. Levine: Have you had occasion to try a gum with greater viscosity, something like locust bean gum?

Mr. Hauser: No, carob bean gum flour—

Voice: That is the same thing.

Mr. Levine: Does that work as well as karaya?

Mr. Hauser: Yes.

Mr. Levine: You apparently require less of that gum to get an equivalent viscosity.

Mr. Hauser: All you need is a two per cent solution of carob bean flour, or gum karaya and you will obtain increased viscosity.

Mr. Levine: What concentration of karaya is that equivalent to?

Mr. Hauser: You take gum karaya and make a two per cent solution out of it.

Mr. Levine: The locust bean gum is very much more viscous at the same concentration. I just wondered if that would find any utility.

Mr. Hauser: I don't think so. I know we are also using two per cent of the carob bean flour.

Lacquer

Mr. Mosher: Have you encountered any difficulty at all in applying a lacquer to a vulcanized rubber sheet?

Mr. Hauser: Yes, considerable.

Mr. Mosher: Do you find it possible to do so?

Mr. Hauser: You can apply certain varnishes and lacquers to latex or rubber but in general it is not an easy thing to do. For example, nitrocellulose varnishes will not adhere to rubber latex surfaces as well as oil varnishes will.

Mr. Mosher: Are they fairly permanent or do they come off very easily?

Mr. Hauser: Well, oil varnishes are used to give latex covered surfaces a glossy appearance.

Mr. Mosher: That is the regular vegetable linseed oil?

Mr. Hauser: Linseed oil varnishes and things of that sort, and shellac varnishes will adhere, too.

Color

Mr. Mosher: About color, when you spray on a vulcanized sheet to make it stick—

Mr. Hauser: You are supposed to color the latex compound before you spread it.

Mr. Mosher: I mean in the event that you want to print, or something like that, can you spray gum? Would it be possible to get that color to stick to your latex, a bright color such as red, for example?

Mr. Hauser: I doubt it.

Mr. Freedman: Disperse the color in latex and spray that.

Mr. Hauser: Yes, you can do that. You can obtain a

color paste which contains latex and spray that until the unvulcanized surface is covered, and then vulcanize both together, and it will stay.

Water Resistance

Dr. Harold: Have you not really a pumice like coating? And if so, how do you treat it to make it truly water resistant?

Mr. Hauser: How do you mean?

Dr. Harold: Is it not, on microscopic analysis, much more like a rubber bath sponge?

Mr. Hauser: Latex?

Dr. Harold: Yes.

Mr. Hauser: You mean it is porous?

Dr. Harold: It is porous and it doesn't shed water. In fact, it holds water.

Mr. Hauser: It is to a certain extent hygroscopic.

Dr. Harold: No, I mean more than that. Doesn't it act very much like a rubber bath sponge? Doesn't it actually hold water and keep the fabric wet?

Mr. Hauser: No. It will absorb moisture to a certain extent, that is, the latex surface itself will, but it will not go into the fabric.

Dr. Harold: I have found cases where latex was impregnated without vulcanization afterwards on a fabric and the fabric kept wet under the rubber more than at other spots.

Mr. Hauser: Yes, because the fabric was not impregnated, and the latex was lying on top of the fabric and not inside of the fabric.

Dr. Harold: The water had arrived from the rubber and could not have reached the fabric except through the rubber, in the experiment tried, and on microscopic examination the rubber was found to be a porous pumice-like mass, and I was wondering if you had met that in your process.

Mr. Hauser: You mean the water went through the rubber into the fabric?

Dr. Harold: Yes.

Mr. Hauser: If you could give me some further details I would be very much interested.

Dr. Harold: Yes, I have found it, on examination, to be exactly like a rubber sponge.

Mr. North: He says the latex was not vulcanized, Mr. Hauser.

Mr. Hauser: The latex was not vulcanized? That may have something to do with it. It probably has. A latex surface which is properly cured cannot possibly let the water go through it, although it will absorb the water to some extent.

Mr. Stein: As a matter of fact, it will remain porous because as soon as you vulcanize you drive the water off.

Mr. Hauser: No. You drive it off during the vulcanization but once it is cured and vulcanized the latex will not absorb moisture.

Mr. Stein: It will not absorb it. It will become more spongy?

Mr. Hauser: Oh, no!

Mr. Kingman: Do I understand that when the fabric has been impregnated and the latex vulcanized, the particles form a continuous film?

Mr. Hauser: Yes.

Mr. Kingman: Just like a rubber sheeting rolled out?

Mr. Hauser: Yes.

Mr. Kingman: So that there are no pores in it?

Mr. Hauser: No. Of course, if you vulcanize too rapidly or use too much heat the water will evaporate too rapidly and it will cause blisters and bubbles which will ruin the waterproofness.

Mr. Kingman: But under the proper treatment?

Mr. Hauser: If it is properly treated it will be waterproof.

Strength

Mr. Levine: How do you explain the fast that a latex film under tension, subjected to any friction, will break very quickly, and the particles come apart? Have you encountered that difficulty?

Mr. Hauser: No. That probably depends on the vulcanization.

Mr. Levine: In dipped goods, for instance, surgeons' gloves?

Mr. Hauser: If dipped goods are produced with latex and are properly made they ought to show much better tensile strength than crude rubber.

Mr. Levine: I am not referring to tensile strength. I mean the tendency to come apart. If you flex a finger and subject it to very gentle friction it opens up at that point.

Mr. Hauser: It ought not to if it is properly made.

Mr. Levine: I think you can usually pick out a latex dipped glove from the other type by that test.

Mr. Hauser: But I know that latex dipped gloves can be sterilized and are used much more frequently than gloves made of naphtha cement.

Mr. Levine: Providing they are not subjected to any abrasion, I think that is right.

Mr. North: You have no difficulty in incorporating water resistant materials such as the waxes with latex, do you, that can be dispersed?

Mr. Hauser: If they disperse, no. There is a paraffin wax in dispersed form, Heliozone, that you can add without difficulty. You also can add Ramasit without difficulty.

Mr. North: I think your statement about the resistance to abrasion is absolutely true. It is a question of the degree of vulcanization. I think you might bring out, for the information of some of these people who aren't fami-

liar with vulcanization, the very low temperatures necessary. When you speak of heat they are likely to think of the temperature of boiling water, or even higher, whereas you can actually vulcanize at the temperature we are in right now, without any addition of hot air.

Mr. Hauser: You can vulcanize from room temperature up to approximately 300 degrees Fahrenheit. All you have to do is regulate your accelerators in accordance with the temperature.

Mr. North: But you do a better job if you do it at lower temperatures?

Mr. Hauser: Yes.

Chairman Herrmann: Are we all out of questions? I thought someone would say something about coloring rubber. Perhaps we had better save that for another evening and have it all out at one time.

Gentlemen, if there are no further questions on this particular subject, I am going to call for a rising vote of thanks to the speaker and to the Program Committee, after which we will adjourn.

. . . A rising vote of thanks was extended . . . (Applause.)

. . . The meeting thereupon adjourned at nine thirty-five o'clock . . .

Wool Dyeing*

By **E. W. PIERCE**
Ciba Co.

UNDER the general heading of Wool Dyeing there have been published thousands of volumes. There are hand-books, technical articles, sample cards and circulars beyond the ability of any one man to read in a lifetime and, if I am not mistaken, you would like me to present in my brief talk this evening, something that has the appearance of being a novelty and which will justify the use of your time and mine. If a chef is called upon to produce some novelty from his kitchen, he looks over his stock of staples and possibles and finds that he has issued many times before everything in the book, so there is nothing left for him to do but raid the ice-box and make up some new combination that has been overlooked. He may serve it as a pie, as a pattie or on toast, but in last analysis it is nothing but a glorified hash; and that, gentlemen, is what I am going to serve to you this evening.

Wool, in its natural state and in course of manufacture, is more likely to take up dirt and impurities than any other textile fiber. It has affinities for so many diverse substances, both chemically and mechanically, that the mind of the dyer must constantly be on the alert to see that his work is not being undermined by invisible agencies. Let us first consider the raw wool; it may only contain the natural wool grease and usual forms of dirt, it may be tanner's pulled wool and contain lime or decomposed polysulphides, it may be the product of carbonization with Aluminum Chloride. Whatever its source or nature of its impurities, the first rule of successful wool dyeing is that the fiber must be uniformly clean. This rule permits of no compromise. Scouring wool with soap and alkalies and then rinsing it out with more water will never result in perfectly clean wool. The visible dirt may be removed, but the fibers are packed and coated with a film or even lumps of earthy soaps, which await their chance to cause trouble later.

Today this state of affairs need not exist, because science has given us synthetic materials which cause the lime, magnesia, iron and alumina to be inert and which aid in the emulsification of the greases in the wool, beside causing the scouring liquors to penetrate and wet the innermost parts of the wool fiber. There are two classes of such products now on the market, the first are derivatives of Naphthalene and the second are made by sulphonating hydrogenated fat acids. I would recommend a complete revision of scouring practice as a first step toward remedying faults in the dyehouse.

Aside from the mere removal of dirt and grease, we must be able to conserve the quality of the wool fibers. This cannot be done if we try to subject as delicate a fiber as wool to the action of strong, hot, alkaline liquors. Such treatment will destroy the elasticity, tensile strength, handle and luster. No scouring bath for wool should ever be hotter than can be comfortably borne by the naked hand.

Next to pure wool we encounter shoddy and rags, which must be both scoured and stripped. It has long been the custom to strip the color by the use of large amounts of Bichromate and Sulphuric Acid. It is true that this reduces the color to a uniform dull shade and

*Paper presented before meeting South Central Section, Nov. 26, 1932.

forms a mordant upon which we may dye fast colors, but it is well to remember that the free Chromic Acid that we produce in this way is reduced at the expense of the substance of the wool itself, which is left in a harsh brittle condition, unable to stand the rigors of either manufacture or wear. Wool may be safely stripped by means of the Zinc Hydrosulphites and acid; the resulting goods are lighter in color and have lost little if any of their original nature.

Now we come to the scouring of yarns and piece goods and encounter a new enemy. In mixing the wool stock before carding and spinning it is necessary to supply oil as a lubricant. That section of the mill is only concerned with the success of their operations and so are very likely to use liberal amounts of mineral oils, from a false view of economy and efficiency, but if they could be made to realize the extra expense and trouble this will cause in the dyehouse, they would see that instead of saving money by the use of mineral oil, they are adding a heavy penalty to the output of the mill. The synthetic wetting-out agents mentioned previously may be utilized in making the spinner's emulsion and will assist the dyer instead of hindering him. Goods that are sent back from the perch to the dyehouse for re-dyeing are always a great tax on the profits and frequently result in the goods being sold for less than standard price. It is very seldom that shaded or clouded goods are the fault of the dyer, although he has to take the blame; the trouble is usually due to some of the operations that have taken place before the goods come to the dyehouse. Because a spinner has been using a certain oil or emulsion for many years or because a scouring boss has been using a certain soap and method for many years does not mean that it is right today. Weavers now use electric lights instead of the oil lanterns they used to hang on their looms, but wool lubrication and scouring is frequently still in the oil lantern stage, in spite of the modern ways that are at their disposal.

Carbonizing frequently introduces irregularities. If the goods are not uniformly saturated and not uniformly dried, we can expect to see these irregularities in the finished piece. There is also a wetting-out agent available which may be added to the strong carbonizing acid, which will cause the burrs and motes to wet out at once and permit the acid to be considerably reduced in strength and so diminish the chances of uneven dyeing from this cause.

Classes of Dyes

Now let us consider the classes of dyes that are of most interest in wool dyeing. First the Vat dyes, then the mordant colors, next the self-contained mordant colors, the fast, level dyeing acid colors, the neutral or weak acid colors, the ordinary acid dyes and last the direct cotton colors. We had best consider these in the reverse order. There are a great number of direct cotton dyes that dye wool very well and in general seem to be faster in every way on wool than they are on cotton, but as they all require a long boiling, are not adapted for yarn or stock and are not considered good enough for piece goods, so are generally used for unions and by garment dyers.

Acid Dyes

The ordinary acid dyes are numberless, many are excellent, having good solubility, level well and possess satisfactory fastness. They are used on ladies dress goods, knitting yarns and yarns for ordinary rugs and carpets. There is so much to be read about them that we need only note them in passing.

The neutral or weak acid colors are inclined to dye unevenly if we attempt to use the usual method of dyeing acid colors. Most of the dye will be taken up from a simple Glauber's Salt bath near a boil and a little Acetic Acid will bring about a clear exhaust. The majority of dyes of this class show a good fastness to washing and to salt water and so are used extensively for sport goods, bathing suits and knitting yarns as well as for nubs and fancy threads in yarn dyed novelties.

The fast, level dyeing acid colors have as their leader Fast Light Yellow GG and then the problem is to get a blue and red that will work uniformly with the yellow. There are now almost a dozen blues of the Sapphire family, each differing slightly from the other and each having its own advocates. With the reds, we have the Rubinols and an excellent fast acid red, but since the reds dye more rapidly than the blues or yellow, some dyers will sacrifice the fastness to light and use an Acid Phloxine on account of its slower dyeing property. When using dyes of this class it is a good rule to get a good exhaust of each addition made before cutting a new sample and to let the goods run without steam while drying the sample and so avoid more color dyeing on in the meantime. The self-contained mordant dyes have chromium in their composition and dye first like ordinary acid colors, using rather more Sulphuric Acid than the regular dyes, although now there is a salt that permits the use of half the usual amount of acid. After the color has been well taken up by the wool and has levelled, an increase in temperature and strong boiling for an hour, converts the dye into a fast chromium lake which is fast to light and washing and compares closely to an ordinary mordant dye, except that it is usually brighter in tone. The advantages of such dyes is that there is no corrosion of the wool fiber by Chromic Acid and it is very easy to match shades, since there is no further change in the color and no color boils on during the taking of a sample. Such dyes are now being used extensively for men's worsted suitings and for the brilliant domestic Oriental rugs that have to withstand the severe caustic and hypochlorite washing process.

Mordant Colors

The mordant colors are applied by three processes. The original method was by means of a chrome mordant. Few dyers appreciated the fact that a chrome mordant might be either a basic Chromium salt, which united with the dye to form a true lake, or it might still contain some free Chromic Acid and subject the dye to a severe oxidizing action. For some dyes the oxidizing action was beneficial, but for a mordant color like Gallocyanine, which is a bisulphite compound, much of the dye was made insoluble in the bath and only adhered to the wool mechanically and caused much crocking. The degree of reduction of the mordant must be right for the dyestuff or trouble will result. Then we have the class of chrome dyes that start as acid colors and are changed in shade and fastened by an after-treatment with Bichromate. This change must be completed in the dyebath, because much free bichromate is taken up by the fiber and unequal drying or heat will complete the development of the color and cause clouds or shading, but a fully developed color is incapable of further change. Then it was found that many of the mordant dyes permitted the use of the bichromate in the same bath. At first an addition was made of an Ammonium salt to assist the fixation of the chrome mordant, but later this was found unnecessary and today the operation is generally carried out with simply dyestuff and Bichromate. Such colors are not to be confused with the self-contained mordant colors mentioned before, they are essentially different and very inferior in working qualities as well as final results, mostly on account of the free Bichromate they leave in the goods and the possibility of the color undergoing changes during storage.

Vat Dyes

So far the trend has been toward greater fastness to light and washing, but at the apex of fastness we note a lack of brilliancy. As the demands of fashion call for brilliancy, we are forced to turn to the vat dyes as an answer to the problem. While the Indigoid vat dyes have been dyed on skeins and may possibly be dyed on pieces, if we have suitable mechanical equipment, yet the bulk of this work has been confined to loose wool and slubbing in closed circulating machines. While the Indigoids are especially suitable, there are also a few of the Anthraquinone series which may be used, but among the Indigoids there are some which seem to have but little affinity for wool, while others are excellent. Good results may be obtained by reducing the regular pastes or powders in the usual way with Caustic Soda and Hydrosulphite at the given temperature, preferably adding some waste sulphite-cellulose liquor and glucose or molasses and then, after dilution and cooling to the temperature for dyeing, adding sufficient Sulphate or Chloride of Ammonium to replace the caustic and liberate Ammonia in its place and so avoid the action of the caustic on the fiber. An important improvement in wool dyeing has been the introduction of the reduced or leuco powders, in which the reduction is much more permanent and not easily oxidized by air contact. These require only the addition of Ammonia and a little extra Hydrosulphite, together with the protective colloids, which not only conserve the wool but promote slow level dyeing. The reduced vat dyes are taken up by the wool in a satisfactory manner and when the dyeing is finished, still show their reduced state by their color. An energetic oxidation is necessary, as well as a restoration to a neutral or even acid reaction. Both conditions are met by a treatment with a solution of Sodium Perborate or Ammonium Persulphate combined with Sulphuric Acid. The oxidation is started at about 100 deg. F. and slowly raised to 180 deg. F. and continued for a half hour. It is certain that wool would not be able to withstand the boiling soap bath which is considered so necessary in the development of full bright shades on cotton dyed with vat dyes, but it is well to finish with a soap bath, not over 130 deg. F., as some colors may be slightly altered in tone by the acid bath.

While it cannot be claimed that vat dyes on wool would be very easy to match in fancy shades, there is little call for work of this kind; they are generally dyed on loose wool or slubbing in the bright shades not obtainable with other fast dyes and then used in stock mixes.

And so we have skimmed lightly over the vast subject of wool dyeing; there are many features that hide below the surface and need to be dug out, so if any present have some feature they want to bring up for a general discussion, the meeting is yours.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Feb. 24.

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Meeting, Northern New England Section, March 11.

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Meeting, Mid-West Section, Schroeder Hotel, Milwaukee, Wis., March 11th.

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Meeting, Philadelphia Section, March 24.

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Annual Meeting, Chicago, September, 1933.

Proceedings of the American Association of Textile Chemists and Colorists

The Methods of Manufacturing Rayon

Factors Affecting Dye Affinity *

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THE prime requisite of any artificial silk process is the conversion of cotton or wood fibres into a soluble form in order that their fibrous structure may be remodelled. There are four processes by which this is done: Viscose, nitro-cellulose, cuprammonium and acetate. Their relative commercial importance may be judged by the proportionate amount of the total American production made by each process:

Viscose	79%
Acetate	14%
Nitro-cellulose	6%
Cuprammonium	1%

Chemically, the yarns made by the viscose, nitro-cellulose and cuprammonium processes are cellulose just as the cotton and wood from which they are made is cellulose. For this reason we speak of them as "regenerated celluloses." However the change in their physical form from the cotton or wool fiber to the rayon filament increases their chemical and physical reactivity by breaking down the size of the cellulose aggregates, aligning them in new directions and hence giving more surface exposed for action. This accounts for the fact that they are usually dyed at temperatures below the boil rather than at the boil as is cotton. Yarns made by the acetate process are a different chemical compound from the cellulose raw material used; they are an ester of cellulose acetate, just as ethyl acetate is the ethyl ester of acetic acid.

I will now take up each process individually.

The Viscose Process

The raw material is a mixture of purified cotton linters and wood pulp in sheet form. Their characteristics are the very first factor influencing the properties of the finished yarn. Increasing the proportion of wood pulp in the mixture increases the affinity of the finished yarn for dye, gives a more even dyeing yarn and a yarn requiring less dye per pound of yarn to obtain a given shade. On the other hand a cotton pulp yarn takes up dye more nearly like cotton and gives a stronger but stiffer yarn. For these reasons neither one nor the other, but a mixtue of the two is used by the manufacturer.

The first step is treatment of the sheets with caustic soda to mercerize them, the product being called alkali-cellulose. This serves to make the cellulose more reactive. After pressing out the excess caustic the sheets are shredded, forming "crumbs." Experience has shown that it is necessary to age these for a period of time to obtain eventually a viscose solution which can be readily spun. Breaking down of the size of the cellulose aggregates, and some oxidization, takes place. The time and temperature of ageing have an effect on the dye affinity of the yarn.

The aged alkali-cellulose is treated with carbon disulfide which reacts with it, turning the white crumbs orange and forming cellulose xanthate. This is really an ester of cellulose with a carbonic acid in which some of the oxygen has been replaced by sulfur. This serves to convert the cellulose into a form soluble in aqueous solution.

This cellulose xanthate is dissolved in dilute caustic soda forming a solution of sodium cellulose xanthate. This solution is what is known to the manufacturer as "viscose." It is a very viscous liquid with a brown color. If one were to attempt to spin it immediately a very stiff thread with poor textile properties would be obtained. Therefore it is ripened by storage in tanks at a constant temperature for several days. During this time it is filtered from one tank to another to remove dirt and foreign matter and subjected to a vacuum to remove air bubbles. The length and temperature of this ripening have an important effect on the dye affinity of the yarn. The longer the ripening time the less the affinity will be.

Spinning consists in forcing the viscose solution through extremely small holes into a bath of sulfuric acid and salts such as sodium sulfate, and collecting the filaments of coagulated cellulose by a bobbin or in a Topham centrifugal pot. There is one spinnerette for each thread being spun and one hole in each spinnerette for each filament. Thus a 40 filament yarn is spun through a spinnerette containing 40 holes. The sulfuric acid in the spinning bath decomposes the sodium cellulose xanthate into cellulose and complex water soluble sulfur compounds and neutralizes the excess caustic soda in the viscose. The salts in the bath affect the cross-

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section and "handle" of the yarn. The rate of coagulation of the cellulose affects the dye affinity; this is controlled by the concentration of acid and salt in the bath and its temperature.

Of more importance in dyeing of the yarn and that which has the more influence on the final dye affinity of the yarn is the spinning tension, or draft as you know it in cotton spinning, to which the thread is subjected while being spun; it also plays a large part in determining the tenacity and elongation of the yarn. The more this tension is, the higher the tenacity, and the lower the elongation and affinity for dye of the yarn. Elongation and dye affinity vary directly with each other in viscose yarns.

In regard to spinning, there are two systems in vogue, bobbing spinning and Topham centrifugal pot spinning. In the former the thread is wound from the coagulating bath onto a bobbin as a bundle of parallel filaments; after washing and drying it is necessary to twist them on another machine. In centrifugal pot spinning the bundle of filaments is guided into the center of an upright circular pot revolving at a high speed; the thread is thrown to the outer part of the pot, building up a "cake" of yarn and twist is imparted to it at the same time. At first glance this would appear the more logical method but newer plants are turning to bobbin spinning as higher spinning speeds can be used, fine deniers can be spun without breaking filaments, higher twists are more easily attainable and washing is easier.

The spun silk, regardless of the spinning system, is washed free of acids and salts and the small amount of sulfur remaining is removed by dissolving it out with an alkali sulfide solution. It is then usually bleached; the degree of bleach will affect the dye affinity.

The dyeing properties and affinity for dye of a given make of yarn are thus the resultant mean of a large number of factors, some tending to decrease and others to increase the dye affinity.

The effect of tension upon elongation of the finished yarn and its relation to dye affinity is of considerable importance. Aside from in the manufacturing of the yarn the elongation can be changed by subjecting the yarn to excessive tension either dry or particularly when moist during winding, knitting and weaving. Yarns with a low elongation absorb less direct and vat colors but more basic color than high elongation yarns. The rate of dyeing is also slower with low elongation yarns.

Other points of interest that I might mention are that yarns with high filament counts will dye lighter with a given amount of dye than yarns with low filament counts. Twist setting and drying of high twist yarns can also affect their dyeing properties. Twist setting by dry steam causes a yarn to dye lighter; twist setting by water causes it to dye darker and more level. Drying at too high a temperature can decrease the dye affinity.

Nitro-cellulose Process

This is so called because nitro-cellulose is an intermediate step in the process. The finished silk is cellulose of the same chemical composition as the raw material. This is the oldest of the four processes. To convert the cotton into a soluble form it is nitrated with a mixture of nitric acid, sulfuric acid and water. The fibers do not dissolve in the acid; they retain their original fibrous form. Wood pulp is not used; the nitro-celluloses from it do not make good silk. By way of interest it is possible to obtain three general classes of nitrates; (a) The class whose composition are approx.—Mononitrates, not suitable to make silk but used to make pyroxylin and lacquers, (b) those whose composition corresponds approx. to the dinitrate, used for silk and (c) those which correspond approx. to the trinitrate, in composition which is gun-cotton and explosive.

Spinning is entirely different from the viscose process. The nitro-cellulose after being washed free from acid is dissolved in a mixture of alcohol and ether containing a small amount of water forming a viscous solution known as collodion. This is filtered and forced through spinnerettes into cells through which hot air circulates. The hot air evaporates the solvent leaving behind filaments of nitro-cellulose which are collected on a bobbin.

The next step is removal of the nitro groups in order to destroy the inflammable nature of the silk and regenerate cellulose with desirable dyeing properties. Treatment with alkali sulfide solutions does this. All the nitrogen is removed with the exception of approximately 0.05%. The sulfide is washed out, the yarn dried and is ready for textile processing.

Note that a much higher denier yarn is *spun* than is obtained after the denitration since the removal of the nitro groups reduces the denier nearly one-third. These yarns are therefore much stronger during the manufacturing steps than are the other types of rayons.

The dyeing properties of nitro-cellulose yarn are determined by the following factors:

(a) Degree to which the cellulose is nitrated.

(b) Spinning conditions which influence the evaporation of the solvent. Tension during spinning has an effect but ot so much so as with viscose rayon.

(c) Denitrating conditions which determine the amount of nitrogen remaining in the fibers and the amount of oxycellulose and hydrocellulose.

Cellulose Acetate Process

Silk made by this process differs from the other three in that chemically it is an entirely different compound from the starting material with different chemical and physical properties. This accounts for its inability to be dyed with ordinary cotton and viscose dyes. This is explained as being due to replacement of two of the three hydroxyl groups in the cellulose molecule by acetate

groups which are not removed later on as are the ester groups in the viscose and nitro-cellulose processes. These ester groups make the yarn more resistant to water; its regain moisture content is lower than the regenerated cellulose types and it is swollen less by water. It has been stated that this lack of swelling in water is the reason why it cannot be dyed by ordinary direct dyestuffs.

The raw material is purified cotton linters. Cellulose acetate is prepared from it by treating in a suitable vessel with a mixture of acetic anhydride, acetic acid and a small amount of a catalyst such as zinc chloride or sulfuric acid. The cellulose dissolves in the acetylation bath. The result of the acetylation being a cellulose triacetate; this could be separated by pouring the reaction mixture into water to precipitate it, dissolving in chloroform and spinning, but the threads obtained from it are harsh and so resistant to water that they cannot be dyed. Therefore the manufacturer saponifies this triacetate until a cellulose acetate corresponding approximately to a diacetate is obtained, precipitates it in water, washes, dries and stores it until ready to be spun. Strange to say, no one has yet been able to prepare an acetone soluble cellulose diacetate directly; the triacetate must be first prepared and then saponified.

To spin the cellulose acetate it is dissolved in acetone, forming a very viscous solution which is filtered, then forced through a spinnerette into a cell containing hot air. The hot air evaporates the acetone, leaving as a residue the thread of cellulose acetate. This is collected on a bobbin and is ready for textile processing without any wet treatment, which is necessary in the other three processes. There are less factors in the manufacturing process to affect the dyeing properties of acetate silk than in the manufacture of the other three types. The affinity for dye of the various makes is determined largely by the amount of combined acetic acid they contain. The higher this is the less the affinity for dye. However it must be remembered that alkaline solutions can saponify the acetate, reducing the combined acetic acid which in turn increases the affinity for dye and renders the yarn liable to staining by direct viscose dyes. It will be found that the acetate silk with the higher content of combined acetic acid is much more resistant to this saponifying action of some scouring baths and can even be treated in boiling water without impairing its luster or changing its affinity for acetate dyes. Boiling water and scouring baths destroy the luster and cross dyeing properties of acetate silks with too low a percentage of combined acetic acid. If it should be desired to deluster an acetate silk with a high acetic acid content it can be done by combining a penetrating swelling agent with an alkaline salt in the scouring bath.

Spinning conditions do not affect the affinity for dye but do affect the depth of shade obtained with a given amount of dye in that they affect the cross section of the yarn which modifies the luster and the apparent color of the dyed yarn. This is of little importance to the knit goods user, but of great importance to the weaver. The effect of spinning tension on dye affinity is negligible compared with the effect of combined acetic acid.

Another point of interest is that acetate yarns are not subject to shrinkage. Stretching wet acetate yarns and drying them stretched will increase their luster considerably.

Cuprammonium Process

This process depends upon the solubilizing action of cuprammonium solutions on cellulose. Cuprammonium solution is copper hydroxide dissolved in ammonia; the blue solution formed is one of the few chemicals which will dissolve cellulose without causing chemical decomposition or reaction. There is no conversion of cellulose to intermediate compounds in this process.

There are several variations in use for preparation of the cuprammonium solution and dissolving of the cellulose in it. For instance, copper hydroxide can be prepared from copper sulfate and caustic soda and the precipitate mixes with cotton linters. The excess of liquid is squeezed out and the mass dissolved in ammonia under conditions to give the most desirable concentration and viscosity. This is filtered and spun by the so-called "stretch spinning" process which consists in forcing the solution through a spninerette into a large glass tube containing a flowing stream of water. The water partially coagulates the cellulose and is moving away from the spinnerette in a linear velocity much exceeding that at which it is forced out of the spinnerette. This draws the cellulose out into very fine filaments. They are then led through an acid or alkaline bath to completely coagulate the cellulose. The only further treatment necessary is a wash in dilute sulfuric acid to remove the copper, followed by washing and drying.

The spinning tension, that is, the amount of drawing out of the filaments by the water, although it is relatively high affects the dye affinity, is overcome by another factor. The cuprammonium solution seems to have considerable depolymerizing action on the cellulose aggregates and makes the fiber very reactive, giving it a high affinity for dye. The amount of copper and ammonia in the cuprammonium solution have an effect on the dye affinity. Cuprammonium yarns are usually spun with higher filament counts than other process yarns and have lower elongations.

It is interesting to note that the viscose process is continuous; by that I mean that once the raw material is entered into the process it must be carried through on schedule until it is spun, otherwise it is a total loss. On the other hand the nitro-cellulose and cellulose acetate processes are discontinuous; they or their solutions can be stored as long as desired before spinning. The older cuprammonium processes are continuous; research has

perfected some of the new cuprammonium cotton solutions to the point where the solution is stable and the process is discontinuous. The actual spinning is a continuous 24 hour daily operation for all processes.

Comparing the dye affinity of the three regenerated cellulose types we find that cuprammonium silk has the greatest affinity for direct dyes and nitro-cellulose the least, viscose intermediate. For basic dyes the order is reversed, nitro-cellulose silk having the greatest affinity and cuprammonium the least.

A brief word about the delustered or dull types of rayons. They vary in their depth of dyeing as compared to their equivalent bright luster yarns according to the method of delustering used; some dye lighter, others darker than their equivalent bright luster yarns. Difficulty is sometimes experienced in the dyeing of dark shades on the dull acetates in getting sufficient depth of color. Actually the yarn has as much affinity for dye as bright lustre yarns of the same manufacture, but the modified interior structure is much more difficult to dye. Adding the color slowly and dyeing at a high temperature is an aid.

You will have noticed that I have mentioned the effect of tension often in this paper. The rayon manufacturer maintains his conditions so that there are no abnormally high tensions and no variations of tension throughout his process, this including spinning and textile operations. The user of the yarn should take the same care as the manufacturer in avoiding these tension irregularities. However, they are not of as much importance to the knitter as to the weaver, unless for example, the knitter should be using yarn of irregular moisture content caused by varying humidity or accidental wetting by water. Remember that the wetter a yarn is the more susceptible it is to stretching, causing change in luster or broken filaments.

In concluding, understand that the dyer of rayon goods does not have to worry about the majority of the factors which I have mentioned that affect the dye affinity. The rayon manufacturer does that; these variables are held as constant as possible. The paper should have shown to you some of the problems which can confront the manufacturer in developing a new yarn and explain such things as variation in dye affinity of yarns made by the same process but different by manufacturers.

Logwood and Its Application*

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Historical

AS A matter of record, the use of logwood for coloring purposes, dates back to the discovery of America. It was shortly after this date that we find that the logs were being brought to Europe by the Spaniards. Little was known about the true coloring principle and very primitive methods were in use for its application. Although crude methods were used in the dyeing and the results probably were not fast, its further use caused some trouble to the manufacturers of Woad in England, so much so in fact, that we find its use prohibited by an Act of Parliament. This ban on the importation of the logwood was probably due as much to the opposition of the Woad manufacturers, because it was hurting their business, as it was to the fugitive colors produced.

About the year 1810, the true coloring principle of logwood was investigated and proper method for its application were formulated. From that date, logwood has been an important article of commerce in nearly all countries. The black color produced on various materials is so intense and beautiful that it has been adopted as the standard for comparison for all other black dyes.

Habitat

The logwood tree is found in various South and Central American countries. The principle countries for export are now, Jamaica, Mexico, Haiti and San Domingo. The tree was probably transplanted by human agency from the Central American countries to the West Indies. The tree grows quite rapidly but seldom attains a height of more than forty feet. The wood is extremely hard, takes a high polish and it is difficult to cut. The best cutting age is between 10 and 20 years. The tree is cut down and stripped of the outer bark, cut into pieces of from three to six feet long and brought to the nearest seaport. It is gathered together by various export agencies and when a cargo has accumulated, it is brought up to the States.

*Presented at meeting of Lowell Textile Student Section, Dec. 15, 1932

Manufacture

In a few words, the logs are chipped, the coloring principle extracted by steam or hot water, and the resulting extract evaporated to various consistencies to comply with the demands of the trade. The logwood is sold in the form of the chipped wood, as an extract, solid or in crystal form. In practice, the manufacture of a standard logwood extract is a complicated subject. It has been found that the wood from various countries has different properties. Some wood is especially suitable for wool dyeing, some for silk dyeing, some for silk weighting, some for cotton dyeing, etc. All these particular features must be taken into consideration when the extracts are made and the different woods must be kept separate.

Chemistry

After a long series of tests and research on the subject, the coloring principle of logwood was found to be a substance which was called Hematoxylin. This is a white crystalline product when pure, but easily changes to Hematine by oxidation. In the manufacture of a commercial extract, it is impossible to prevent some oxidation taking place, and unless means are taken to prevent it or to increase it, the ordinary extract of logwood will have an oxidation of from twelve to fifteen per cent. By means of alkali or other chemicals such as nitrite of soda, the oxidation may be increased up to about 98%. The extract as it comes from the extractors, is a thin brownish liquid. This is evaporated to about 51° Tw. as the standard.

This extract may be evaporated to dryness and then we get the solid or crystal form.

The logwood is also sold in the form of the chip wood. This form is used at the present time by the fur dyers, leather dyers and the silk dyers. The chips are generally used after being "cured." The curing process takes from eight to ten weeks' time. The chips are piled up on the floor, sprinkled with water and the chips turned over at frequent intervals. The temperature and humidity must be watched very closely. The combination of the moisture and the heat changes the Hematoxylin to Hematine and the chips assume a bronzy appearance. A slight increase in the temperature and the humidity will over develop the Hematine and then the chips are worthless for extracting purposes.

Logwood is classed as one of the mordant dyestuffs. In all cases some metallic mordant must be used. The two chief mordant salts used are iron and chrome.

Application to Silk

Silk must first be well boiled off to remove the silk gum. It is then placed in a bath of so-called nitrate of iron for one hour, the bath testing from 10° Be. to 20° Be. Afterwards, the silk is well washed and the iron set with hot water or soap. The silk is then dyed out with a combination of logwood and fustic and soap. This general procedure may be carried out with the silk in the form of skeins or piece goods. To obtain additional weight, the silk may be given a treatment with tinphosphate and then treated as above. In practice, the formulae used in dyeing silk black with logwood, vary considerably. In some cases, copperas is used in place of the nitrate of iron. In some instances, copperas, bluestone and fustic are used together in the first bath and after rinsing, the silk is placed in a bath of Hematine or logwood and soap. The time, temperature, and amounts of the various products to use, vary with the shade and weight desired. Silk may be weighted with logwood by first passing the silk through one or more passes of tinphosphate and then directly into a suitable logwood bath. The unoxidized logwood is always used in this instance. As high as 200% logwood extract may be used for this purpose and the weighting matter picked up or absorbed by the silk is enormous. By these means, silk may be weighted over 200%.

In the dyeing of silk with logwood, various other natural dyestuff products are used. They all impart certain characteristics to the resulting black shade obtained. Fustic has already been mentioned. In addition, such products as Gambier extract, Osage Orange extract, Divi-Divi extract and Quercitron extract are used. They all produce either certain color variations, weight or bloom to the black.

The black shade obtained by the use of logwood on silk is the finest black which can be obtained. The color is fast to light, washing, sea water, hot pressing and is absolutely unchangeable under artificial light.

Logwood and Wool

Wool must first be mordanted with Bichromate of Potash. The chrome mordant obtained is either called a reduced mordant or an oxidizing mordant, depending upon the acid or assistant used with the chrome. If sulphuric acid is used with the chrome, we obtain what is known as an oxidizing mordant. This form of chrome only has an affinity for the unoxidized logwood. If Tartar, Tartaric Acid, Formic Acid or Bisulphite of Soda is used with the chrome, we obtain what is known as a reduced chrome mordant. This type of chrome only has an affinity for the oxidized type of logwood known in the trade as Hematine.

The old standard mordant for logwood or Hematine Black on wool called for a bath of about 3% Chrome, 3% Half Refined Tartar and ¾% Bluestone. This was boiled up for an hour and a half and then the wool was rinsed. Then it was dyed out with Hematine. If the mordant was 3% Chrome and 1% Sulphuric Acid, it was boiled up and washed in the same way but then logwood was used for the dyebath. These have been the standard mordants for generations and always produced fine results. An important point which might be mentioned at this time is the fact that if you are dyeing in any of the regular type of dyeing machines which is

supposed to hold say 500 pounds of raw stock wool, it is possible to load this machine to double its capacity and still obtain even results when it is dyed with Hematine or logwood. This increase in production is not obtainable with any of the other types of aniline blacks.

In recent years, a new method of dyeing the wool with Hematine has come into use which greatly shortens the time of dyeing. Two things are necessary in this new formula, first is to have a perfectly reduced chrome mordant and second to use a highly oxidized form of Hematine. The perfectly reduced chrome mordant may be obtained by the use of Tartaric Acid or combinations of Tartar, Formic Acid and Bisulphite of Soda. This type of chrome mordant only has an affinity for Hematine and so the low oxidized logwood should not be used as the color will not be properly developed later. It is only necessary to use one and a half or two per cent of chrome in this case and since it is all reduced on the fiber, the mordant liquor is perfectly clear and it is not necessary to rinse before applying the Hematine. For this particular method of dyeing, we have developed a very highly oxidized Hematine called Red Paste and the oxidation runs as high as 98%.

The following characteristics of a properly dyed logwood black on wool may be kept in mind: The shade is fast to washing and extreme fulling. It will not stain white wool. All vegetable matter, such as burrs, will be covered, eliminating the use of speck dyes. The wool picks up about 5% additional weight. The shade is unchangeable under artificial light and will stand more than 100 hours Fade-Ometer test. In redyeing obsolete or off-shades of color, it will cover them all perfectly and give an even shade of black.

Application to Cotton

While the dyeing of black cotton by logwood has been replaced to a large extent by direct black or sulphur black on account of the saving in time, logwood is still used for cotton dyeing and printing and is the cheapest fast black today on the market. In the printing of cotton cloth, logwood is used in the form of a steam black and this is very fast even standing the chlorine bleach. In dyeing, the cloth is boiled up in a solution containing certain amounts of logwood extract, bluestone and soda ash. The cotton as it comes from this bath is a dark blue. The cotton is allowed to sweat overnight when the blue color changes to a black. The dyebath is not exhausted and is used over and over again by making slight additions to the old bath. The cotton picks up about ten per cent in weight. On piece goods, a continuous process is used. The cloth is passed through a concentrated bath of logwood and bark extract, dried over hot cans, then passed through a bichromate of potash solution, then through a washer to a steam box and then to a starch mangle and to a drier.

Application to Rayon

Rayon has a great affinity for logwood and it may be applied very easily. The rayon is worked in a strong solution of logwod extract (about 10% solution) containing about 7½% bluestone based on the weight of the logwood used for one hour at the boil. Rinse lightly and developed in a 2% solution of soda ash. This produces a fast deep black.

Application to Celanese

Celanese will dye according to the solid solution theory of dyeing. That means that one solid will dissolve another. In this case we make a super-saturated solution of logwood. The celanese is treated in this solution for about half an hour at about 150° F. The celanese is then washed clean with cold water. The black color is then developed in a 2% solution of Bichromate of Potash, for one-half hour at 150° F. The black so obtained is fast to perspiration, washing, light and hot pressing.

Application to Leather

Logwood may be applied to leather either in the drum or as a brush proposition. The skeins are generally chromed tanned and neutralized. Then they are drummed with a logwood solution for a period of half an hour and then struck with some metallic salt such as chrome, bluestone or copperas. For brush blacks, the chrome tanned skins are spread out on a bench and the solution of logwood is spread over the surface of the skin and brushed in. It is then rinsed and a solution of the striker is brushed on to develop the color. This treatment is generally repeated two or more times before the correct depth of shade is obtained.

Application to Other Materials

The dyeing possibilities with logwood are by no means exhausted in the above-mentioned subjects. Enormous quantities are consumed in the fur dyeing industry. This is a very interesting subject and time does not permit me to go into detail. Here, too, the dyeing of the black is a developed proposition and the skins must undergo several treatments of logwood and striker solution before the correct shade is obtained.

Logwood is also used to dye vegetable ivory for the button trade. Likewise, the dye dominoes and checkers and bottle tops. Last but not least, logwood is also used to blue the steel in gun barrels and hammer heads. Logwood also has certain medicinal uses and is prescribed in certain types of stomach disorders.

I trust that all of the above will give you some idea of the universality of this very interesting product. A large amount of research has already been carried through to determine better ways to apply logwood to various materials and this research is still going on.

AMERICAN
DYESTUFF
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A PREDICTION

RESPONSIBLE, intelligent business men of high rank in their particular fields have been chary for the last few years of making any statement regarding business conditions which could be construed as a definite prediction of the start of the upturn from the depression. Many of them never participated in polyannic prophecies. Others learned from bitter experience that it was better to say nothing at all, or to qualify carefully any phrases to which they gave utterance regarding the approximate date of the revival.

It is therefore doubly significant that Leonor F. Loree, president of the Delaware & Hudson Railroad, should issue a clear cut pronouncement this week to the effect that, in his opinion, a revival of general industrial activity will be well under way within a year. Mr. Loree is a man of high reputation in the railroad business, whose direction of his own company is widely recognized as unusually efficient. The basis for his opinion regarding the upturn is contained in the following excerpt from his statement:

> "We have put off renewals of plant and equipment for at least two years and it is my belief that by the middle of next Summer extensive renewal of equipment will have to be made—and I think that holds true of industry generally as it does of the railroads."

The ordinary, garden variety of textile manufacturers will have difficulty in seeing eye to eye with Henry Ford in his announcement, also made this week, that present business conditions are good, not bad, but he has good grounds for a more optimistic outlook of his own difficulties in the words of Mr. Loree.

REFLATION?

FORCED reflation will result in economic dislocations even greater than those existing today, due chiefly to the fact that costs would increase much faster than income, says the current issue of the *Textile Organon*, published monthly by the Tubize Chatillon Corporation, which contains a discussion on the present economic situation.

"For example," points out the paper, "real estate operators today have made many low-priced rentals on long term leases; now if reflation comes along, their income will be fixed at a very low rate and the expenses of operating the properties would increase greatly; the result would be a worse situation than their present dilemma. Railroads and utilities would run into the same situation as between fixed and variable costs and income. In the same way the cost of living would increase under reflation, and the income of the wage earner would inevitably lag much behind his increased living expenses, with reduced purchasing power as the result.

"Briefly, little would be gained by reflation, supposing it could be put into effect, and the potential losses to the public would be much greater than the best of the mediocre benefits which could be expected to result."

The paper further points out that "inflationists speak of reflation as benefiting the debtor class and adversely affecting the creditor class. Now with the exception of that small minority of people who have currently borrowed or lent money, it is essentially true that most debtors are also creditors . . . The attempt to speak of debtors and creditors in this country as two distinct groups of people is misleading, as well as inaccurate. And the idea that reflation will affect one group of people as against another group of people is absurd."

Under the sub-caption "The Way Out," the *Textile Organon* states: "The program which we believe would most quickly encourage an improvement in business and in prices by natural economic methods, as contrasted with a forcing method such as planned reflation, is essentially a restatement of principles which we have presented and discussed in the past.

"1. Balance the national, state, and municipal budgets by reducing the expenses of government, legislating higher income and inheritance taxes, a tax on legalized beer, and a sales tax, if that be necessary.

"2. Settle the war debt problem quickly and equitably.

"3. Reduce tariffs and other artificial trade barriers which are now choking the free exhange of goods internationally.

"4. Points two and three would need to be considered together with the problem of the return of key countries to the gold standard.

"5. A continuation of the policy of selective debt write-off in an orderly manner which should be aided by the passage of the new bankruptcy bill preventing selfish minorities from precipitating undesirable reorganizations.

"All of these points depend on political action for their solution. Public psychology, business activity, and prices will be improved when these problems are solved, or even when a real attempt is made to solve them. It is to be hoped that the 'new deal,' which is now being shuffled, will clearly show these vital problems to be in the political cards for play on the first hand dealt after March 4th."

Formadine Black

This is a straight Direct Black that stands Formaldehyde after-treatment. It is dyed in the usual way, the same as any other Direct Black. At the expiration of the dyeing it is given an after-treatment in a new bath with Formaldehyde, which is said to increase the strength of the Black, and produce the correct shade. It is also said to increase the washing and light fastness properties and produce a very deep and intense Black.

It is recommended by the manufacturer, John Campbell & Co., for dyeing cotton skeins, hosiery, rayon and also piece goods.

Formadine Black is said to be used in place of Developed Black (BH and others) because it is claimed to discharge better, and it is also used as a ground for Vat Prints.

Formadine Black is said to give good fastness to washing in a boiling soap bath, and leaves Celanese unstained.

Snell with "Soap"

Foster Dee Snell has been appointed consulting technical editor of *Soap*. Dr. Snell has written technical articles on detergents and detergency for that publication for some years, and will continue to write for them as in the past.

New Bedford and Fall River Alumni

The combined alumni organizations of New Bedford and Fall River Textile Schools will hold a dinner on February 24th at the Hotel Bristol, New York City, at 6 P.M. It is requested that Fall River men who plan to attend will notify Mr. James L. Giblin, U. S. Testing Co., 1415 Park Avenue, Hoboken, N. J. New Bedford men should notify the secretary, Arthur H. Ronne. William Smith, Principal of the New Bedford School, will be one speaker and it is hoped that Henry W. Nichols of the Fall River School will also speak.

LOUIS A. NORTH

It is with regret that we hear of the death of Louis A. North at his home in Hendersonville, N. C. in January. He was in his thirty-fifth year. Mr. North had many friends especially in the states of South Carolina, Georgia, Alabama, Louisiana, Texas and Mississippi where he traveled in the interests of the American Aniline & Extract Company.

He served overseas during the World War as a Lieutenant in the 109th Regiment, Company D, 28th Division. He had a very enviable war record and received several decorations for bravery in action. It was his misfortune to lose a leg in action. He will be interred at Arlington Cemetery in Washington.

He is survived by his widow and two children.

Maher Color & Chemical Co.

The Maher Color & Chemical Co., Inc., 612-620 Orleans St., Chicago, Illinois, has taken over the dyestuff and chemical business of Charles E. Maher and will continue to be the midwestern representative of the Onyx Oil & Chemical Co. of New Jersey. They will carry a complete line of oils, finishes, chemicals and dyestuffs in their Chicago warehouse. Charles E. Maher will continue with the new concern as president.

NEW PATENTS

(*Abstracted by Synthetic Organ Chemical Mfrs. Assn.*)

Dyeing Preparation for Coloring Chrome Leather and Process of Making the Same. (Prepared from nitroso compounds and aromatic amino and hydroxy compounds.) August Dorrer, Wilhelm Scheurer, and Arthur Ohmer, of Ludwigshafen-on-the-Rhine, Ger., assignors to General Aniline Wks., Inc., of N. Y., No. 1,876,641, Sept. 13, 1932.

New Dyestuffs of the Diamino-triphenylmethane series. (New blue dyestuffs of very good equalizing properties, fast to alkali, prepared by condensing a benzaldehyde disulphonic acid with an N-alkylated aryl-amine.) Otto Boger, of Dessau in Anheim, and Oswald Meissner, of Uerdingen-on-the-Rhine, Ger., assignors, by mesne assignments, to General Aniline Wks., Inc., N. Y., No. 1,876,842, Sept. 13, 1932.

Manufacture of New Azo Dyes. (An improvement on or modification of application Serial No. 427,961, new trisazo dyes which have the valuable property of dyeing a regenerated cellulose rayon even brown to blue to black to violet shades.) Rainald Brightman, of Blackley, Manchester, England, assignor to Imperial Chemical Industries Ltd., of Westminster, England, No. 1,876,848, Sept. 13, 1932.

Yellow Pyrazolone Mono Azo Dyestuffs. Heinz Eichwede and Josef Rachor, of Frankfort-on-the-Main-Hochst, Ger., assignors to General Aniline Wks., Inc., of N. Y., No. 1,876,884, Sept. 13, 1932.

(Continued on page 142)

Effectiveness in Grey Room Operation

(Continued from page 112)

5. Raise and Lower Pressure Foot (Insert Ends)	.04	100	.04 min.
6. Sew Seam	.15	100	.15 min.
7. Cut Thread	.04	100	.04 min.
8. Release Seam and Dispose..	.06	100	.06 min.
9. Remove Cut Portion	.03	100	.03 min.
10. Change Trucks (Once in 30 Pieces)	2.40	3	.07 min.
			.99 min.
33-1/3% Incidental Delays			.33 min.
			1.32 min.
Task in Hours			.022

B—MERROW SEWING MACHINE

Element	*Time Needed*	*% Occurrence*	*Time Allowed*
1. Take First End and Square.	.15	100	.15 min.
2. Take Second End and Square.	.17	100	.17 min.
3. Insert in Presser Foot and Sew Seam	.25	100	.25 min.
4. Cut Threads	.05	100	.05 min.
5. Dispose	.05	100	.05 min.
6. Change Trucks (Once in 30 Pieces)	2.40	3	.07 min.
			.74 min.
33-1/3% Incidental Delays			.25 min.
			.99 min.
Task in Hours			.0165

VII. *Production*

Accurate Production records will be kept on the back of the Daily Bonus Card by the Sewers. The Lot Numbers and Seams sewed will be shown.

VIII. *Inspection and Penalty*

All seams must be straight, even and sewed face to face, and no puckering of cloth allowed. Seams will be inspected periodically by the Foreman, who may deduct part or all of Operator's Bonus for improper sewing. Any Operator persisting in carelessness should be replaced.

Example of Calculating Bonus

Task .022 Hr. Three Needle Seam
.0165 .Hr. (Merrow Seam)

Bonus 60% Time Saved plus 20% Time Taken

	Bonus Lost	Task Just Accomplished	Task Surpassed 5%	Task Surpassed 10%	One Sewer Loses: One Sewer Just Accomplishes Task
Seams Sewed Three Needle	409	455	450	478	455
Seams Sewed Merrow	544	606	637	667	544
Time Taken Hours	10.0	10.0	10.0	10.0	10.0
Time Allowed in Hours Three Needle	9.0	10.0	10.5	11.0	10.0
Time Allowed in Hours Merrow	9.0	10.0	10.5	11.0	9.0
Bonus Time Three Needle Sewer	..	2.0	2.3	2.6	2.0
Bonus Time Merrow	..	2.0	2.3	2.6	..
Bonus Time Layerout	..	2.0	2.3	2.6	1.5
Total Time Paid For Three Needle Sewer	10.0	12.0	12.3	12.6	12.0
Total Time Paid For Merrow.	10.0	12.0	12.3	12.6	10.0

Total Time Paid For Layerout	10.0	12.0	12.3	12.6	11.5
Pay Layer Out at 25 cents	$2.50	$3.00	$3.08	$3.15	$2.88
Pay Three Needle Sewer at 15 cents	1.50	1.80	1.85	1.89	1.80
Pay Merrow Sewer at 12 cents	1.20	1.44	1.48	1.51	1.20
Total Day Pay	5.20	6.24	6.41	6.55	5.88
Bonus Layerout	...	.50	.58	.65	.38
Bonus Three Needle Sewer	...	.30	.35	.39	.30
Bonus Merrow Sewer	...	.24	.28	.31	...
Total Bonus	...	1.04	1.21	1.35	.68

Comparison of Costs and Anticipated Savings

LAYOUT AND SEW

Present Average Production (Six Months Ending March 1931)	1,492,111 yds.
Present Average Direct Labor (Six Months Ending March 1931)	$149.84
Present Average Direct Labor C.P.Y. (Six Months Ending March 1931)	.0100
Proposed Average Monthly Production	2,170,000 yds.
Proposed Average Monthly Direct Labor Cost	$146.91
Proposed Average Direct Labor Cost per Yard	.0067
Anticipated C.P.Y. Saving	.0033

Recommendation No. 4—June 3, 1931

(Thirteen weeks later than Recommendation No. 1)

Grey Room—Layout and Sew

It is hereby recommended that the following temporary Task and Bonus rate be applied to the Layout and Sew Operation at such time as the Management deems advisable, the same to be applicable to sub-normal production periods of 300,000 yards per week and less.

Present Status

At the present time this operation is performed by a force of three operatives, one man to open and layout the pieces and two girl sewers. The bales are delivered by the Storehouse Crew and the bands are cut and removed by them.

Proposed Status

It is proposed to operate the Grey Room with two operatives, transferring one sewer to the Make-Up Department. The Layerout will square the ends instead of the sewer, and otherwise the status will be the same as Recommendation No. 3 of April 20, 1931.

There are no changes in the items of Planning, Delivery, change of Layout and Mechanical from those as noted in Recommendation of April 20, 1931.

Operation No. 10—Layout and Sew June 3, 1931
Temporary Rate Sheet Grey Room Department

I. *Task*

A. .0175 Hr. per Three Needle Seam
B. .012 Hr. per Merrow Seam

II. *Bonus*

60% of Time Saved plus 20% of Time Taken for Sewed and Layerout.

III. *Classification of Work*

This task covers all the grey goods to be opened and sewed in the Grey Room.

IV. *Conditions*

This temporary rate sheet is designed to take care of protracted periods of sub-normal production, averaging 400,000 yards per week and less.

Under this temporary layout the organization of the Grey Room will consist of two operators, a layerout and a sewer. The second sewer will be kept on the payroll and transferred to the Make-Up Department during these temporary periods, so as to be always available.

The service extended by the Grey Storage Crew will be continued as outlined in the Temporary Rate Sheet of April 20, 1931.

The duty of squaring the ends will be transferred from the Sewer to the Layerout. With this change a maximum production can be obtained under this plan because the Layerout will have to feed only one machine and the time necessary in laying out for the second sewer will be made up with the added duty of squaring the ends.

Most of the goods will be sewed on the Three Needle Machine but the Merrow Machine will be at hand in case there are lots requiring a Merrow Seam.

All other conditions same as Temporary Rate Sheet of April 20, 1931.

V. *Duties*

A *Layerout*

In addition to the duties as outlined in Temporary Rate Sheet of April 20, 1931, the Layerout will square all ends, being careful not to tear off more than is necessary.

B *Sewers*

Same as Temporary Rate Sheet of April 20, 1931 with the exception of the squaring of the ends which duty has been transferred as stated above.

VI. *Detail of Operations and Synthesis*

A Singer Three Needle Sewer

Element	*Time Needed*	*% Occurrence*	*Time Allowed*
1 Place First End on Track	.05	100	.05 min.
2 Take Second End and Pin on Track	.20	100	.20 min.
3 Pin First End	.15	100	.15 min.
4 Raise and Lower Presser Foot (Insert Ends)	.04	100	.04 min.
5 Sew Seam	.15	100	.15 min.
6 Cut Thread	.04	100	.04 min.
7 Release Seam and Dispose	.06	100	.06 min.
8 Remove Cut Portion	.03	100	.03 min.
9 Change Trucks (Once in 30 Pieces)	2.40	3	.07 min.
			.79 min.
33-1/3% Incidental Delays			.26 min.
			1.05 min.
Task in Hours			.0175

B Merrow Sewing Machine

Element	*Time Needed*	*% Occurrence*	*Time Allowed*
1 Take First End	.05	100	.05 min.
2 Take Second End	.07	100	.07 min.
3 Insert in Presser Foot and Sew Seam	.25	100	.25 min.
4 Cut Threads	.05	100	.05 min.
5 Dispose	.05	100	.05 min.
6 Change Trucks (Once in 30 Pieces)	2.40	3	.07 min.
			.54 min.
33-1/3% Incidental Delays			.18 min.
			.72 min.
Task in Hours			.012

VII. *Production*

Same as Temporary Rate Sheet of April 20, 1931.

VIII. *Inspection and Penalty*

Same as Temporary Rate Sheet of April 20, 1931.

Date ..... Name of Company

Approved..... Correct.....

Manager *Consultant in Management*

Example of Calculating Bonus

Task .0175 Hr. (Three Needle Seam)

Bonus 60% Time Saved plus 20% Time Taken

	Task Just Accomplished	*Task Surpassed 5%*	*Task Surpassed 10%*
Seams Sewed	572	600	629
Time Taken—Hours	10.0	10.0	10.0
Time Allowed—Hours	10.0	10.5	11.0
Bonus Time Sewer	2.0	2.3	2.6
Bonus Time Layerout	2.0	2.3	2.6
Total Time Paid to Sewer	12.0	12.3	12.6
Total Time Paid to Layerout	12.0	12.3	12.6
Pay Sewer at 15 cents	$1.80	$1.85	$1.89
Pay Layerout at 25 cents	3.00	3.08	3.20
Total	4.80	4.93	5.09
Bonus Sewer	.30	.35	.30
Bonus Layerout	.50	.58	.70
Total Bonus	.80	.93	1.09

Comparison of Costs and Anticipated Savings

Layout and Sew

Present Average Production (Six Months Ending March, 1931)	1,492,111 yds.
Present Average Direct Labor (Six Months Ending March, 1931)	149.84
Present Average Direct Labor C.P.Y. (Six Months Ending March, 1931)	.0100
Anticipated Average Monthly Production	1,290,000 yds.
Proposed Average Monthly Direct Labor Cost	101.20
Proposed Average Direct Labor C. P. Y.	.0081
Anticipated C.P.Y. Saving	.0019

Recommendation No. 5—September 30, 1931

(Sixteen weeks and six days later than Recommendation No. 1)

It is hereby recommended that the Single Operation be placed on Task and Bonus.

Present Status

A rebuilt burner has been added to the Singer giving it a total of four flame burners. These together with the Rotary Plate make for a satisfactory two side singe.

The speed of the Singer has been increased 33⅓%. The high speed now runs at 235 yards per minute, whereas the former speed was 176 yards per minute. The low speed now runs at 186 yards per minute, whereas the former speed was 143 yards per minute.

Operation 25 Plate Singe September 30, 1931

I. *Task*

A. .107 Hr. per 1,000 Yards Slow Speed.
B. .085 Hr. per 1,000 Yards Fast Speed.
C. .75 Hr. for Heating Plates.

II. *Bonus*

60% of Time Saved Plus 15% of Time Taken. Bonus will be paid on a group basis. Two men will make up the Singe Crew, the Operator and the plaiter man.

III. *Conditions*

A. The crew will consist of two men viz the operator who will be held responsible for the quality of the work, the proper heating of the plate and the care of the singer; and a plaiter man who will plait down in the Grey Bins or onto flat trucks.

IV. *Duties*

A. The duties of the Operator are as follows:

1. The proper heating of the plate.
2. The threading up of the Machine.
3. Watching the quality of the singeing and preventing "burn-offs,"
4. The keeping of the production records.
5. As outlined in the Recommendation of April 20, 1931, for the Grey Room—Layout and Sew Operations, the Operator will continue to receive the sewed up truck-loads, inspect and throw up the ends and place the trucks in position for singeing.

B. The duties of the Plaiter Man are as follows:

1. To assist the Operator in the threading up and starting of the Singer.
2. The plaiting down of the goods in the Grey Bins or on flat trucks.

V. *Time Studies and Synthesis*

A. Slow Speed

Speed 186 Yards Per Minute

Time Needed Per 1,000 Yards	5.37 Min.
20% for Delays	1.07 "
Total	6.44 Min.
Hours Allowed per 1,000 Yards	.107

B. Fast Speed

Speed 235 Yards Per Minute

Time Needed Per 1,000 Yards	4.25 Min.
20% for Delays	.85 "
Total	5.10 Min.
Hours Allowed per 1,000 Yards	.085

C. Heat Plates. No detail. Time allowed .75 Hr.

VI. *Inspection*

Operators must watch cloth closely at all times to make sure it is receiving sufficient singe and that no damage is done to cloth by flame or plate. As cloth can be very easily destroyed in this process, inspection must be rigid.

VII. *Marking Production*

Operator will mark on production card lot number, yards and class of speed.

VIII. *Penalty*

Any work produced under these rates which is considered below the standard of quality, or any carelessness on the part of the operators will subject same to the loss of all or part of the bonus earned at the discretion of the Foreman.

Date..... Name of Company.....

Approved..... Correct.....

Manager *Consultant in Management*

Example of Calculating Bonus

Task

.107 Hr. per Thousand Yards Slow Speed 20%
.085 Hr. per Thousand Yards Fast Speed 80%
.75 Hr. for Heating Plates.

Bonus 60% of Time Saved Plus 15% of Time Taken.

	Machine Time (9.25 Hr.) 85% Production	Machine Time (9.25 Hr.) 90% Production	Machine Time (9.25 Hr.) 95% Production
Yards Singed—Slow Speed.....	17,484	18,414	19,530
Yards Singed—Fast Speed.....	88,595	93,765	98,935
Total Production	106,079	112,179	118,465
Time Allowed:			
Slow Speed—Yards x .107.....	1.87	1.97	2.09
Fast Speed—Yards x .085.....	7.53	7.97	8.41
Heat Plates	.75	.75	.75
Total Time Allowed	10.15	10.69	11.25
Total Time Taken.....	10.0	10.0	10.0
Total Time Paid	11.59	11.91	12.25
Task Exceeded by.....	1.5%	6.9%	12.5%
Total Pay—Operator at 22½c. per Hour	$2.61	$2.69	$2.76
Total Pay—Plaiter at 17½c. per Hour	2.03	2.09	2.14
Day Wages—Operator at 22½c. per Hour	2.25	2.25	2.25
Day Wages—Plaiter at 17½c. per Hour	1.75	1.75	1.75
Bonus Pay—Operator	.36	.44	.51
Bonus Pay—Plaiter	.28	.34	.39

Comparison of Costs and Anticipated Savings

Singe

Present Average Monthly Production in Yards (Five Months Ending May. 1931).....	1,532,200
Present Average Monthly Direct Labor Cost (Five Months Ending May, 1931).....	$103.20
Present Average Monthly Direct Labor Cost Per Yard	.0067
Proposed Average Monthly Production in Yards....	1,750,000
Proposed Average Monthly Direct Labor Cost.....	$82.96
Proposed Average Monthly Direct Labor Cost Per Yd.	.0047
Anticipated Cost Per Yard Saving.....	.0020

Note:

This final recommendation for the entire Grey Room was adopted October 12, 1931, approximately seven months later than Recommendation No. 1.

This length of time was unduly long for installing a Task and Bonus system in the Grey Room due to the fact that twenty-two operations in some of the other departments of the mill needed the system far more than the Grey Room. Thus, the work in those departments was interposed in order to lower the cost of the production of the plant in a shorter length of time than it would have taken if the Grey Room study had been completed first.

NEW PATENTS

(Continued from page 138)

Production of Monoaminoanthanthrones and Derivatives Thereof. (Important vat dyestuff intermediates, comprises heating monoaminoanthanthrone with m-methoxy-benzoyl chloride in nitrobenzene.) Max Albert Kunz, of Mannheim, Karl Koeberle, of Ludwigshafen-on-the-Rhine, and Werner Zerweck, of Fechenheim, near Frankfort-on-the-Main, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,876,972, Sept. 13, 1932.

Substitution Products of Anthanthrones. (Relates to the production of dyestuffs and dyestuff intermediates by replacing the amino groups of amino-anthanthrones by other radicals.) Max Albert Kunz, of Mannheim, and Karl Koeberle and Erich Berthold, of Ludwigshafen-on-the-Rhine, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,876,973, Sept. 13, 1932.

Halogen Derivatives of Anthanthrones. (For direct use as dyestuffs and as intermediate products, obtained by directly replacing the nitro group or groups in mono- or polynitroanthanthrones by halogen.) Max Albert Kunz, of Mannheim, and Karl Koeberle and Erich Berthold, of Ludwigshafen-on-the-Rhine, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,876,974, Sept. 13, 1932.

Production of Highly Halogenated Derivatives of Pyranthrone. (As a new article of manufacture pentabromopyranthrone dyeing cotton scarlet shades.) Max Albert Kunz, of Mannheim, and Karl Koeberle, of Ludwigshafen-on-the-Rhine, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,876,975, Sept. 13, 1932.

Process for Manufacturing Monohalogenated Naphthostyril Compounds. (Being dyestuff and pharmaceutical intermediates. Heinz Scheyer, of Frankfort-on-the-Main, Ger., assignor to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,877,057, Sept. 13, 1932.

Yellow Mono-azo Dyestuffs. (Obtainable by coupling the diazo compound of the hitherto unknown 2-chloro-4-amino-1-methylbenzene-6-sulfonic acid with resorcinol or substitution products or homologues thereof.) Hermann Wagner, of Bad Soden Am Taunus and Bartholomaus Vossen, of Frankfort-on-the-Main-Hochst, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,877,092, Sept. 13, 1932.

Process for Preparing Dyestuffs of the N-N-Dihydro-1.2.'.1'-Anthraquinone Azine Series and Products Obtainable Thereby. (Dyeing vegetable fibers fast blue tints.) Karl Schirmacher, Wilhelm Schaich, Arthur Wolfram, Hans Tamke, Kurt Billig, and Werner Schirmacher, of Hochst-on-the-Main, Ger., assignors to General Aniline Wks., Inc., of N. Y., N. Y., No. 1,877,146, Sept. 13, 1932.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

CLASSIFIED

CHEMIST—Assistant dyer, 28 years of age, married; graduate Lowell Textile Institute, 2½ years' experience in laboratory of leading dyestuff concern. Familiar with uses and application of all classes of textile dyestuffs. Desires position in laboratory of dyestuff concern, mill or sales. Can go anywhere. Address: Box No. 747, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

Position Wanted—A laboratory assistant, 21 years of age, with some dye-house experience desires a position in dyestuff laboratory. Has studied textiles and is a graduate of Pratt Institute Technical Chemistry Course. References. Address Box No. 765, American Dyestuff Reporter, 440 Fourth Avenue, New York.

DYER—Cotton and Rayon Piece Goods Dyer seeks position. Years of experience on continuous and pigment vats, developed, indigosol, sulphur, direct and basic colors. Jiggs, pads or reel machines, all styles cotton and linen goods, crepes, celanese and mixtures. Technical institute graduate. Address Box No. 766, American Dyestuff Reporter, 440 Fourth Avenue, New York.

Technical Textile Translations, German to English. Patents, articles and books. Rates reasonable. Address Box No. 767, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

Wanted—Experienced Dyestuff Salesman, on commission basis, to represent in New Jersey and New York State a dyestuff manufacturer. State qualifications and experience. Address Box No. 768, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.